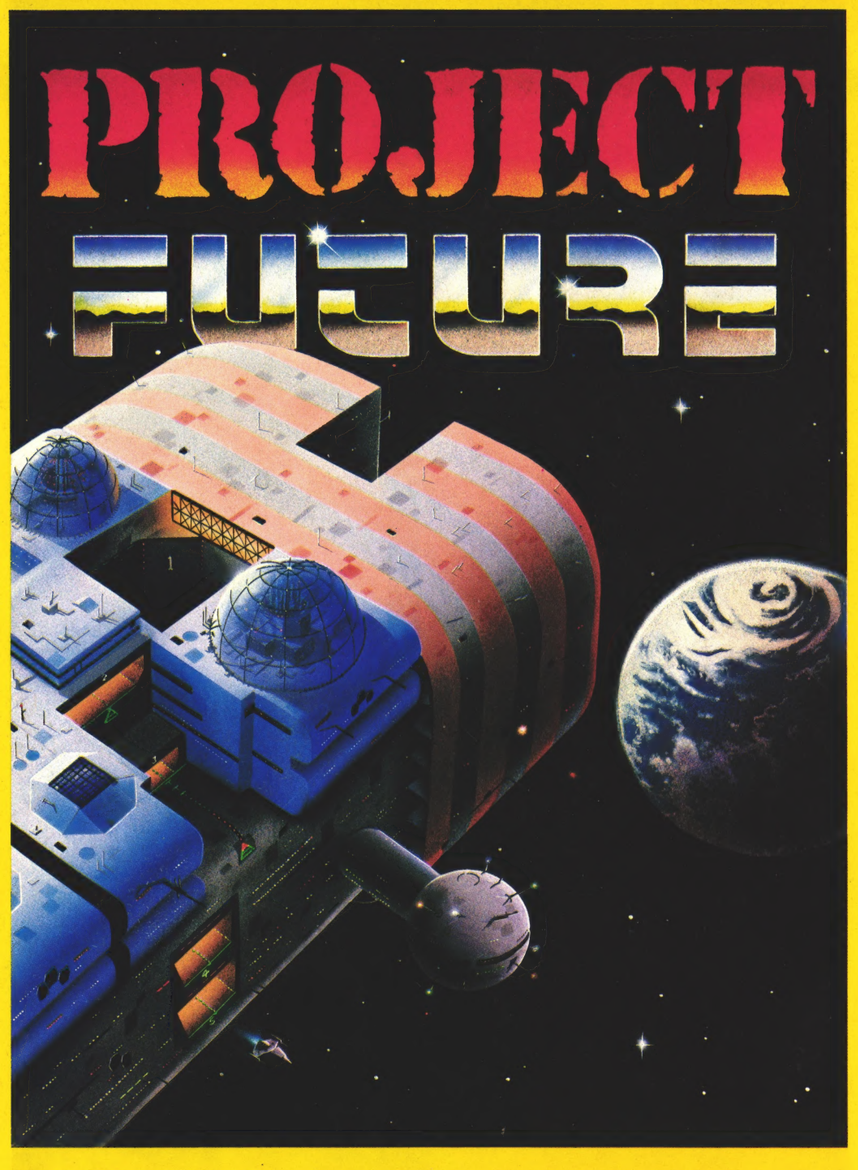
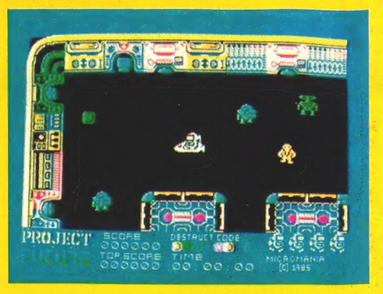
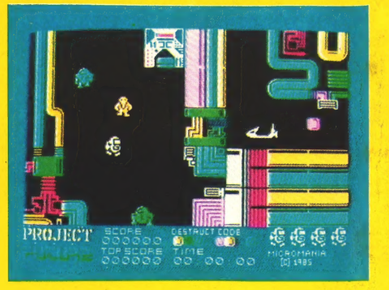
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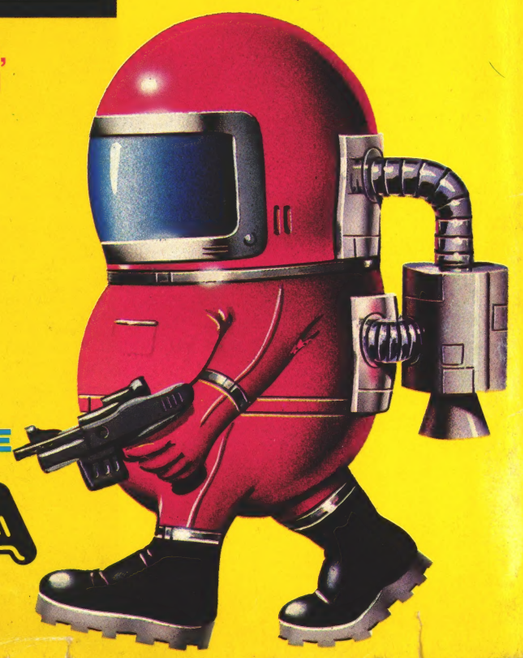
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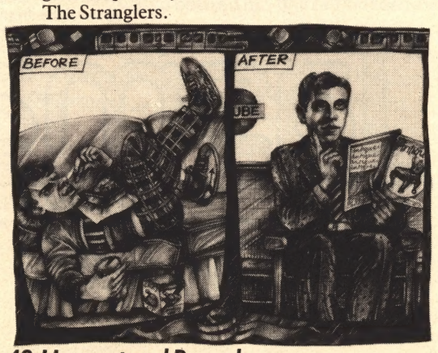
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SINCLAIR Answers

THE KEYS TO SUCCESS

REPLACING YOUR SPECTRUM'S RUBBER KEYS WITH AN ADD-ON KEYBOARD CAN CONSIDERABLY IMPROVE USERBILITY.

Most Spectrum owners would probably agree that typing on the Spectrum is akin to fingering an embossed corpse — the 'dead flesh' feel of the basic rubber keyboard can be unconducive to tackling advanced applications, such as word-processing. The remedy is an add-on keyboard, a unit which provides a superior travelling-case lay-out which either replaces or covers the cadaverous original.

A number of independent companies have come out with their own products, and even Sinclair itself has realised the problem by releasing its own Spectrum Plus, fundamentally a normal Spectrum under a QL keyboard (see elsewhere in the issue).

Choosing the correct keyboard from the bewildering assortment currently on the market can be quite a problem. We decided to take a look at a fairly broad selection of these and assess their relative merits. We tried nine keyboards in all, but before looking at each of these in turn, here are a few general points to bear in mind.

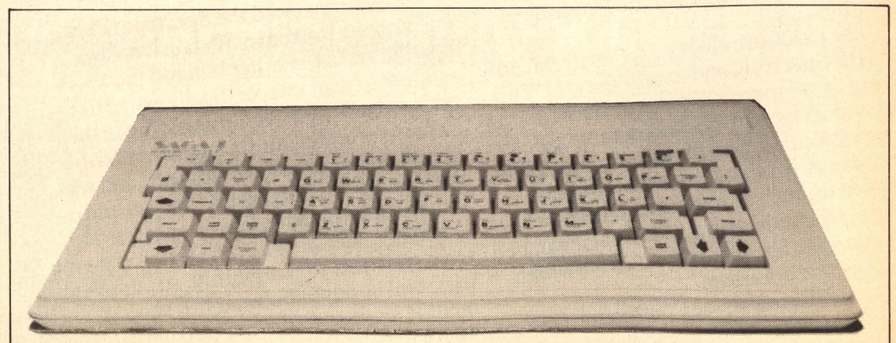
Obviously, any full-travel keys are going to be an improvement, but it's surprising how different these can feel. Distinguishing between these is really a matter of personal choice, but we've compared each keyboard to the feel and travel of keys normally found on electric typewriters. If you intend to touch type, then having the alphabetic characters in the normal QWERTY format is necessary, but not really enough — the layout of the other symbol keys around this is also very important. For instance, touch typists would usually expect to find the semi-colon key next to the 'L' key, so that it would lie under their right-hand's little finger. A full-sized space bar would also be considered essential.

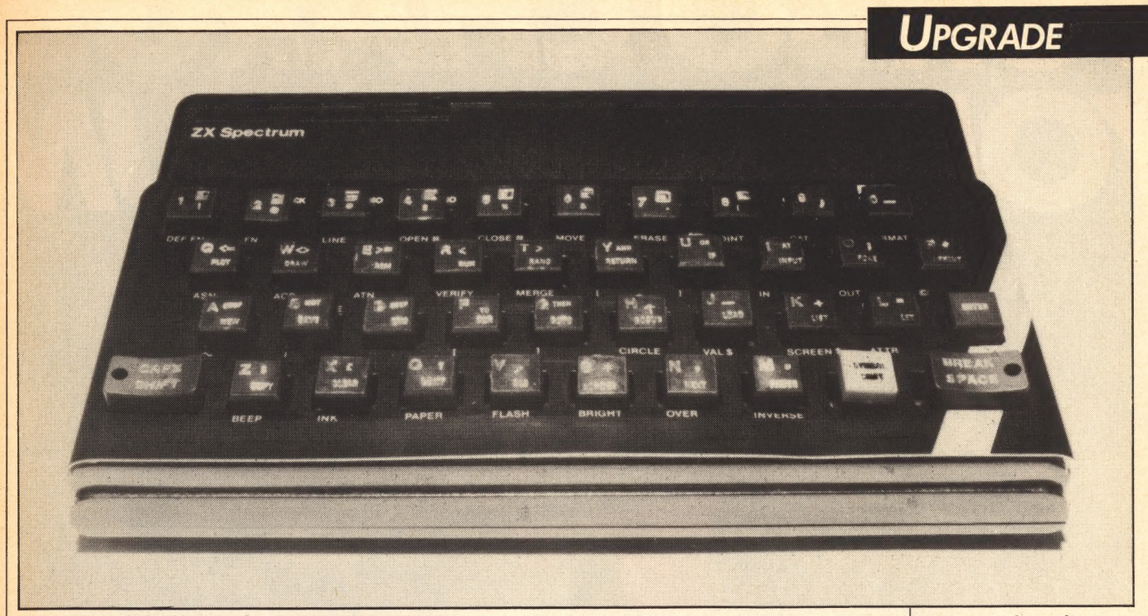
On the original ZX Spectrum, which has 40 keys, all combinations of Caps Shift and Symbol Shift are necessary to obtain some of the keywords and symbols. The argument as to whether or not single key entry is preferable remains unresolved, but it is generally accepted that some of the more frequently used command words ought to have separate keys. These usually include such commands as Delete, Edit, Extended Mode (normally Caps Shift and Symbol Shift), and symbols such as the full-stop and comma. In a number of cases, the add-on keyboards cater for these, possibly even duplicating some of the keys by adding a numeric pad for quick data entry, repeating the cursor keys in a more accessible place, or giving two shift keys. Some manufacturers have gone even further than this, to the extent of adding new keys, such as reset (or an on/off switch), or switches to control the beep volume for each key press.

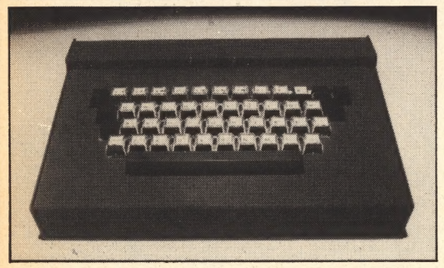
Having all these extra keys is not always quite as beneficial as it sounds. The logic circuits required to implement the additional keys on some keyboards can cause problems using a few commercial programs, so we suggest that if you intend to use your new keyboard for a particular program (for instance, a word-processing package) that you check that all the functions work before you buy.

A few of the keyboards we looked at not only allow you to fit your basic Spectrum into your new case (usually just the PCB from inside the Spectrum), but also permit the internal fitting of the power supply and some peripherals, so another point which you ought to consider, is which peripherals you might want to attach. One of the most popular of these is the Interface One, and some keyboards do allow this to be fitted internally; however, on a number of the keyboards we checked, Interface One cannot even be fitted directly to the expansion port in the usual way, due to the necessity for it to be able to slide under the back base of the keyboard. In this case, you would have the additional expense of purchasing a 56-way extension ribbon connector, so that you can distance the peripherals from the keyboard.

Other peripherals, such as some of the joystick interfaces, can also cause problems: for instance, if your interface has an overhang which would normally come over the top of your Spectrum case, then it may no longer fit; or the interface may have a socket on the front, which is no longer accessible due to the height of the new keyboard. Again, these problems can be







solved with an extension connector, but it is an extra expense which should be considered. Now onto the keyboards themselves.

At £28.50, the Kelwood Computing K-Board is by far the cheapest of the keyboards we looked at. The instructions printed on the rerverse side of the box explain how to fit the board. This is the only keyboard we looked at which involves removing the metal template, which is then replaced over the new keys. All the key caps are then pushed on to their respective click contacts. The key caps, are not particularly clear to begin with, and were already starting to fade after only a little use.

The feel of the keys was similar to that found on a number of calculator keyboards. They have a click, but are not adequate for touch tying, despite the box claim to being a professional keyboard.

K-Board is not recommended, improving little on the standard product.

The H & K keyboard is a sturdy matt-black metal box, overwhich you have to overlay, key legends from the sheet provided.

The keyboard layout is a replica of the original Spectrum with the addition of a full-length space bar and six optional keys (likely to remain blank for most people since they are not initially wired, and unless you've got some electronic experience, you're probably not going to be able to connect them — the instructions provided give no help in this matter). One advantage of having so few additional keys (effectively only one) is that you're unlikely to have any compatability problems with software. The keys are closer together than would normally be preferred, but could (at a stretch) be used for touch typing.

This is certainly the most robust casing we looked at, and may have particular appeal in some fields where the micro receives rough handling. Although it's a pity that the keyboard wasn't up to the same standard as the casing itself, this is, nevertheless, a product worth considering (especially at the new reduced price).

The keyboard form dk'tronics consists of a hard plastic case containing a key-by-key copy of the original Spectrum key layout, a space-bar, and a 12-key numeric pad. The instructions are clear, and explain how to fit the keyboard with, or without, Interface One. Fitting Interface One within the case involves removing the PCB from inside Interface One, but this did not prove to be difficult. Your cable to the first Microdrive can then be brought out of the left-hand side of the case. The diagram in the instruction manual shows where the power ▶

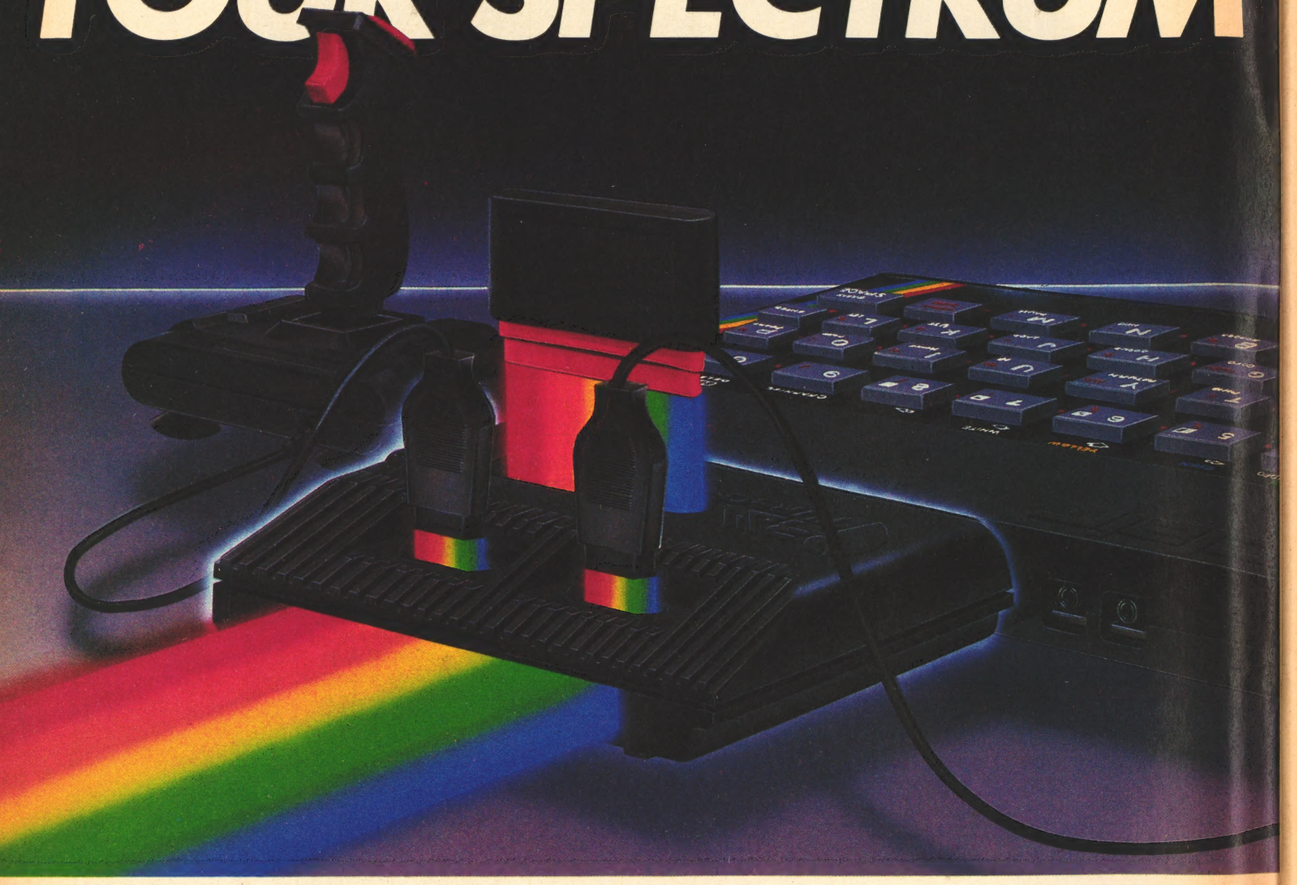
Above: Kelwood's K-Board is at the budget end of the market; left: the robust H&K Electronics keyboard.





Opposite page: the Saga Emperor's looks match its quality; below left: Transform's keyboard is a heavyweight contender; below right: dk'tronic's keys can be too close for comfort.

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RAM TURBO

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The stonechip keyboard can be fitted without removing the Spectrum PCB from its casing.

supply can be fitted inside your new keyboard case. Unfortunately, there were no instructions to explain this, and experimentation seems to suggest that you'll have to remove the power supply from its casing.

Once complete, you must stick your own keyboard legends onto the blank keytops from the sheet provided. These did not give a really professional finish (and may not last too long under continuous use), but the full-travel keys have quite a good feel. They are also not overly rugged, and tended to be a little close together for fast touch-typing.

Despite these minor criticisms, this is a reasonable product which will be sufficient for many people's needs, but for a little extra it is possible to obtain a keyboard with many more features. We reckoned that its main advantage is the ability to fit most of the essential peripherals neatly inside the case.

If size is anything to go by, then the Lo>>Profile (from Advanced Memory Systems) has got to be a winner; but despite this the case is only large enough to accept the Spectrum PCB. However, the single sheet of instructions are (to say the least) a little concise in explaining how to fit this.

The case itself is plastic (which is just as well, because our review model was supplied with only four nylon isolation washers instead of the eight labelled in the diagram), and the base tends to bend easily, though fortunately the top is made of a much more rigid material. This should not cause any problems when the keyboard is sitting on a table, but could be better for travelling purposes.

The layout of the original Spectrum keyboard has been fairly closely adhered to, with the addition of a space bar, large Enter key, separate Caps Lock and numeric keypad. All the key legends are very clearly printed on white, cream and grey keys, and the keyboard to retains the same colour legends as the Spectrum (red, black and green), with the exception of the ink colour legends above the numeric keys, which are labelled white on the black case.

The keys themselves are very well laid out: each key has a satisfying spring action when depressed, making this the cheapest keyboard which could really be used for touch typing.

Fitting the Emperor keyboard (from Saga Systems) is unusual in that the base of the Spectrum is retained and bolted underneath, which means that the Interface One can be fitted without difficulty, though this does tend to make the keyboard slope quite badly, another problem with this is that the keyboard overlaps its base and tends to be a little unstable when typing. Fitting is quite quick but, as with a number of these keyboards, you then have to spend time sticking on the key legends.

The original 40 keys have been increased to an impressive 67 on this keyboard — not, however, for single key entry. Instead, there are two Caps Shift and four Symbol Shift keys with the more commonly used functions ranged around them. This allows the user to press adjacent keys (with one finger if you're really dexterous) for such symbols as the full-stop, comma, semi-colon, colon, mathematical operators, delete and cursor keys.

The keys have a good spring action, and would be suitable for touch typing. One feature which is lacking is the numeric pad for fast data entry, but it's dubious as to where this could be put on an already large keyboard. One other point which should be made is that because there is no single key entry, the keyboard is likely to work with most, if not all, software. Saga claim that two of the biggest problem packages, *Tasword* and *Beta Basic* (where the keyboard scan rate is halved), both work on their product.

The Stonechip Electronics' keyboard will particularly suit those not too interested in DIY, as it is one of the two keyboards which can be fitted without removing the Spectrum PCB from its case — a thin PCB in the new case is fitted to the sockets on the back of your present Spectrum. The new case is then screwed together with your Spectrum inside, and new sockets on the surrogate PCB are visible from the back of the Stonechip case.

For some reason, the positioning of some of these sockets has been changed, with the power input being placed between the MIC, EAR and TV sockets. This has also pushed the MIC socket slightly closer to the expansion port, which may cause problems with some peripherals, so check before you buy.

The keyboard is very similar to the original with the addition of an Enter key, single key delete, Extended mode, space bar and two reset keys (similar to an on/off, you have to press both together, so you won't clear the machine by accident). Two switches at the top of the keyboard act as a beep amplifier (when pressing keys), and a load/save facility so, for instance, you can have both MIC and EAR connected without getting the warning alarm when you try to save a program.

The keys themselves are full-travel, but feel a little plastic-like compared to a number of the other keyboards we looked at. The keyboard is not really up to really fast touch-typing standard, but its ▶

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Tel: (0925) 62907.

small size and ease of fitting are bound to make it very popular.

The Cheetah 68FX1 from Fox Electronics is probably the most professional-looking of the keyboards we examined. It has a hard black plastic top, and metal base giving a very rigid case. Fitting is fairly easy, requiring the removal of the Spectrum PCB from its case, and the instructions for this are quite adequate. It is also possible to permanently fit Interface One, which involves removing part of the case from the interface, and the instructions explain how to do this as well.

The keyboard has 68 two-tone grey keys, including single key delete, space bar, break, cursor pad, Run, graphics shift, edit and numeric pad. Though these are clearly labelled, the lack of colour (only red and black) makes it a little difficult to use at first. The other slight criticism is that the Symbol Shift and Caps Shift are not clearly distinguished, but this is not a serious disadvantage. Though the keyboard has 68 keys, three of these are blank, where Fox had intended to implement extra functions, then decided against them when the plastic case had already been moulded.

All in all a good product — in fact, we were so impressed that we're giving away two 68FX1's as prizes in our competition (see elsewhere in this issue).

Some of you may remember the Fuller FDS keyboard, and more particularly the company behind it, Fuller Design: after the bad debt claims and the delivery problems, Fuller have finally bitten the dust; the keyboard, however, lives on and is now being marketed by a company called Nordic Keyboards.

Nordic's Keyboard's case is made of a sturdy black mottled plastic, and accepts the Spectrum including its original casing, so it's very easy to install — useful, as our review model came without instructions. Mounting holes on the base of the new keyboard case also seems to allow for the internal fitting of Interface One, though with no instructions and no screws, we had difficulty trying this out. There also appears to be an internal mounting for the power supply, but there was no way in which we were going to chance trying that without the manual.

The keys are all light grey and well printed with clear black lettering. Part of the original keyboard layout has been sacrificed in order to give a better QWERTY layout: this also includes a separate cursor keypad, larger Enter key, two of each of the shifts, a single key delete, extended mode, break, comma, full-stop and full-sized space bar. All the keys are well laid out, and have a very reasonable feel for touch typing. Another product worth considering.

The Transform keyboard is certainly one of the heavy-weight contenders, being constructed entirely of black metal. This gives a very rigid, durable case, but also ups the price — it was the most expensive one we looked at.

Fitting the Spectrum to it tended to be more difficult than with other models: being a metal case, isolation of the Spectrum PCB is obviously important, Transform have solved this by leaving the base of the Spectrum (plastic) connected to the PCB, acting as its own insulator. It is possible to fit Interface 1 inside the keyboard, and instructions are also given for fitting the power supply internally; this, however, requires cutting wires from the power supply and connecting them to the on-off switch and LED indicator. Having live power next to a metal case is likely to deter many people — maybe it would be better to leave the power supply outside the keyboard if this is the only way of connecting it.

The keyboard itself looks very good. All the light grey keys retain the legend colours used on the original Spectrum, with the exception of the ink colour keys and the large Enter (which is black labelling on a bright red key base). In all, there are 60 keys, including a full-size space bar, single key DELETE, EXTENDED MODE, EDIT, semi-colon, colon, full-stop, comma and numeric pad.

All of the nine keyboards we tried, with the possible exception of the K-Board, could be recommended as replacements for the Spectrum's original rubber mat. There's not that much between them. The choice is really up to you. If you particularly want to be able to touch type, then the Lo>>Profile, FDS, Cheetah 68FX1 or Transform would seem to be the best. We've tried to summarise the most important features in *Fig. 1*. Good fingering!

By Marcus Jeffery, technical writer.

Saga Systems,
Woodham Road,
Woking,
Surrey.
Tel: (04862) 69527.

Stonechip Electronics,
Brook Trading Estate,
Deadbrook Lane,
Aldershot,
Hants GU12 4XB.
Tel: (0252) 333361.

Nordic Keyboards UK,
Randles Road,
Knowsley,
Merseyside L34 9EZ.
Tel: (051) 548 2220.

Fox Electronics,
Fox house,
35 Martham Road,
Hemsby,
Great Yarmouth,
Norfolk NR29 4NQ.
Tel: (0493) 732420.

Transform,
41 Keats House,
Porchester Mead,
Beckenham,
Kent.
Tel: (01) 658 6350.

FIG. 1 KEYBOARD COMPARISON

	Price:	Remove PCB:	Interface One:	Full-travel keyboard:	No. of keys:	Full-sized Space bar:	Single-key Delete:	Large Enter key:	Single-key Extended mode:	Separate cursor keys:	Numeric or keypad:	On/Off Reset switch:	*Size(mm):
Kelwood K-Board	£28.50	Yes	Yes	No	40	No	No	No	No	No	No	No	230x140x35
H & K Keyboard	£39.95	Yes	No	Yes	47	Yes	No	No	No	No	No	No	310x200x85
dk'tronics Keyboard	£45.00	Yes	Yes	Yes	53	Yes	Yes	No	No	Yes[2]	Yes	No	350x245x70
A M S Lo Profile	£49.95	Yes	No	Yes	53	Yes	No	Yes	No	Yes[2]	Yes	No	435x220x50
Saga 1 Emperor	£54.95	Yes	Yes	Yes	67	Yes	Yes[1]	Yes	No	Yes[2]	No	No	370x185x50
Stonechip Electronics	£59.95	No	No	Yes	44	Yes	Yes	Yes	Yes	No	No	Yes	280x175x65
Nordic FDS	£59.95	No	Yes	Yes	51	Yes	Yes	Yes	Yes	Yes	No	No	340x225x65
Cheetah 68FX1	£67.95	Yes	Yes	Yes	65	Yes	Yes	Yes	No	Yes	Yes	No	390x175x65
Transform Keyboard	£69.95	Yes	Yes	Yes	60	Yes	Yes	Yes	Yes	Yes[2]	Yes	Yes	405x220x75

1: Separate key, but still requires dual key press. See text for details.
2: Cursor keys still require dual key press.
*Size = Width x Depth x Height
Notes on Table:
Remove PCB: Does the Spectrum have to be removed from part or all of its case?
Interface One: If Interface One can either be fitted as normal, or fitted internally, the answer is 'Yes'.

TOUCH-MASTER

THE TOUCHMASTER GRAPHICS TABLET
SPECTRUM GRAPHICS THE EASY WAY.

Pounding away at a keyboard is not the best way to create graphics; there are no keys which can really cope with wiggly lines and patterns. There is, however, an alternative: the Touchmaster is a graphics tablet that allows pictures to be created by drawing with a stylus on a touch sensitive pad.

The idea is not new, and has been tried before, but on the whole failed due to lack of software. Touchmaster (the company) are designing a range of compatible software covering games, education and utilities.

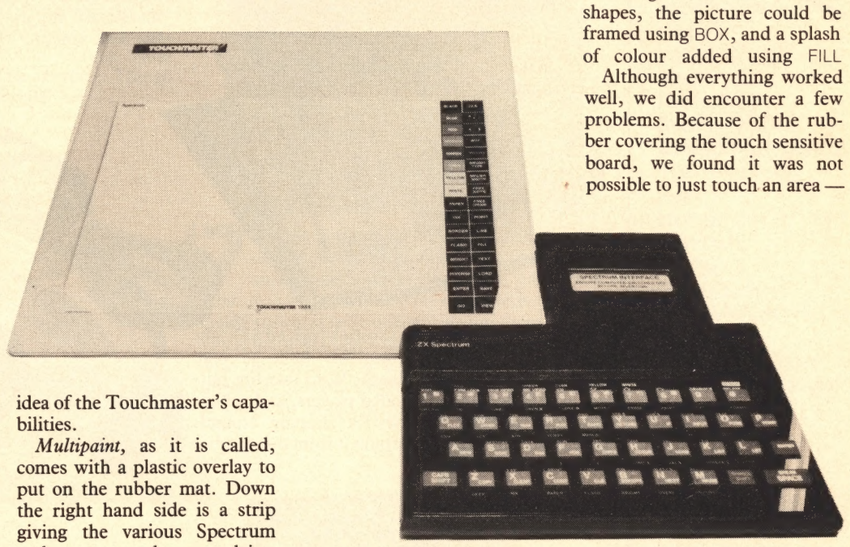
Touchmaster has the look and feel of a child's doodling toy. Its pale grey plastic case and bright logo having a distinct 'playroom' style, but in action, the Touchmaster is far from being just a toy.

Most of the Touchmaster's top is taken up with an A4 (256 by 6 pixels) sized work surface. This is a flat rubberised affair that can be overlayed with a plastic film for drawing on with a special stylus. Removal of the unit's top reveals the rubber to be a protective 'mat' for a touch sensitive board. This connects via a ribbon cable to a PCB, on which the guts of the machine are held.

Three large chips dominate the PCB: a 6803 looks after the system, while two EPROMS control two of the four interfaces on the Touchmaster's rear. A parallel interface allows the Touchmaster to be linked to the Spectrum (as well as the Commodore 64 and Vic 20, the other two sockets are for power and a rather ambiguous foot switch.

Interfacing at the Spectrum's end is via a flat brown box. Inside is a PCB containing the various data I/O lines and a Z80A. An edge connector on the rear of the interface allows the user to link up other add-ons (a joystick, for instance) when the Touchmaster is in use. The interface is also compatible with Sinclair's Interface 1.

The hardware is neat, compact, and simple; the user should have few problems in geting started. What instructions are required, though, are given in a skimpy User Guide. Getting going can be done in one of two ways: a graphics program, called Multipaint, provided with the package can be loaded, or a short listing from the User Guide typed into the Spectrum. We found the graphics program the best to start with, because it gives a better idea of the Touchmaster's capabilities.



Multipaint, as it is called, comes with a plastic overlay to put on the rubber mat. Down the right hand side is a strip giving the various Spectrum colours and graphics commands, while another column contains several new ones to enhance graphic design. These only become operational after *Multipaint* has been loaded.

After a few failures to load the software, we finally got the title screen and were on our way. All changes to the screen can be made with Touchmaster, so as far as *Multipaint* goes, the Spectrum keyboard is virtually redundant (unless you want a bit of text on the screen).

If the user fancies doing some graphics work, they can select the type of brush used. For instance, it could be a dot, vertical, horizontal or diagonal line. All of these can be used to good effect when drawing free hand, as they each produce some neat line effects. Should you be more interested in, say, cartoon style illustrations, the Free Dots option allows dotted lines to be drawn.

For something along more abstract lines, four commands draw shapes, without the need to specify parameters. A circle, for instance, can be drawn by first selecting the centre point. A second press, at a different position, tells the machine the circle's radius. Another circle command asks for the diameter, rather than radius. Polygons of between 3 and 20 sides can also be drawn, but the wider you make them, the more they resemble circles. After experimenting with the various shapes, the picture could be framed using BOX, and a splash of colour added using FILL.

Although everything worked well, we did encounter a few problems. Because of the rubber covering the touch sensitive board, we found it was not possible to just touch an area — it had to be pressed relatively hard. A grid over the top of the overlay would also have helped, as it is easy to lose track of your last position, and draw in the wrong place (this can be rectified using INVERSE).

Finally, we found selecting a command somewhat of a problem. FILL, for example, was so close to FLASH on the selection strip, it was easy to get the wrong one, even if the middle of the correct box was pressed. Much care is needed when using the pen to select commands to actually draw.

Touchmaster is one of the best touch tablets around. It has not yet got the ability to take over from the keyboard, this has still to be used for programming, but must be content with living alongside it; but as an introduction to computing for children, the Touchmaster wins hands down.

By Steve Applebaum, staff-writer.

TOUCHMASTER SPECS

The Touchmaster package (priced £149.99) includes Touchmaster board, power supply, User Guide, Multipaint, stylus and interface.

Additional software (Touchware) for the 48K Spectrum (all priced £9.99):
(Early Learning)
Simply Simon, a memory game; *Simons Shapes*, helps develop shape and colour recognition; *Simon Saw*, a jigsaw; *Simon says*, a memory game; and *Simons Squares*, a dot-to-dot and wordsearch package.
(Games)
Draughts; Othello; Perilous Castle; Multipaint.

Touchmaster,
PO Box 3, Port Talbot,
West Glamorgan, SA13 1WH.
Tel: (0656) 744770.

TOP 10 UPGRADES

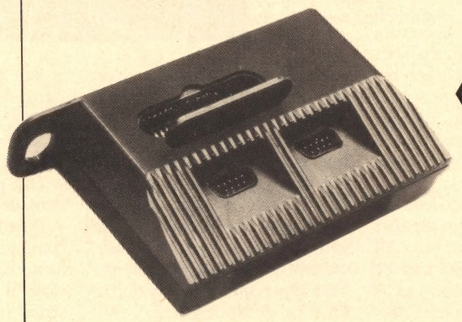
WE CHART THE TEN BEST-SELLING SPECTRUM ADD-ONS — DO THEY DESERVE THERE PLACE AT THE TOP, AND WHAT ARE THE INGREDIENTS OF THEIR SUCCESS?



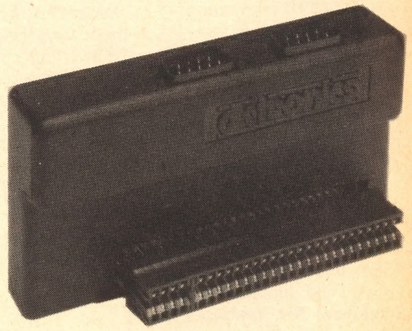
1 dk'tronics Quickshot Joystick (priced £9.95): it's not too surprising that a joystick is the best-selling Spectrum peripheral. It's helped by the fact that it's quite cheap, and has four suckers that keep it still during the frantic action required by the vast amount of Spectrum arcade type games.



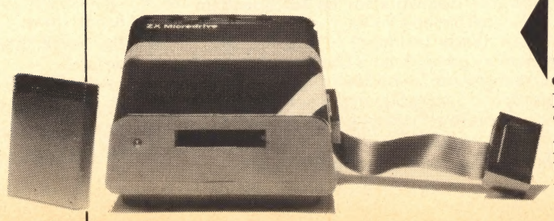
2 Kempston Pro 5000 Joystick (priced £13.50): a tough, reliable joysticks, built to take considerable punishment. With two fire buttons, it will also suit lefthanded players, and rubber pads help prevent the joystick slipping around. Perhaps just the price is keeping it from the number one spot.



3 RAM Electronics Turbo Interface (priced £22.95): for every joystick there must be an interface: the most popular in our survey is this one, sporting the now ubiquitous term 'Turbo'. It certainly seems to have eclipsed Sinclair's Interface 2, which doesn't even figure in the top ten. Similar to Interface 2, the Turbo allows two joysticks and cartridge software to be used with your Spectrum.



4 dk'tronics Dual Port Interface (priced £13.00): interfaces are obviously popular with Spectrum users, and this one offers two Atari 9 pin D-type joystick ports. It can be used with either Kempston type joysticks or can emulate the cursor keys. This interface, unlike the RAM Turbo, does not offer a cartridge port.



5 Sinclair Microdrive (priced £45.00): although not renowned for its reliability, the Microdrive is still by far the cheapest secondary storage, other than cassettes. Microdrives require Sinclair's Interface One, but up to eight of them can be 'daisy-chained' together once this interface has been purchased. The Microdrives will undoubtedly come under competition from Rotronics Wafadrives (reviewed in this issue), but the starting cost is less, and the access times are faster.

6 Protek Switchable Interface (priced £19.95): an interface purely for joysticks, but it can be switched from one different joystick type to another. There are 256 Input/Output 'ports' on the Spectrum. These are not bits of hardware but different locations in I/O memory. The joysticks and compatible games around do not all use the same ports, hence the use of a switchable interface. Things are never as simple as they should be!



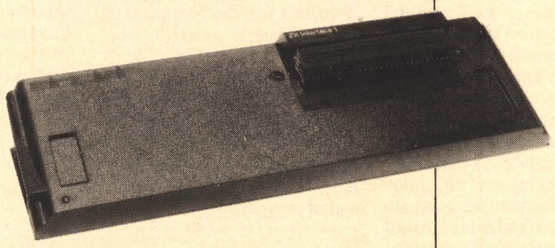


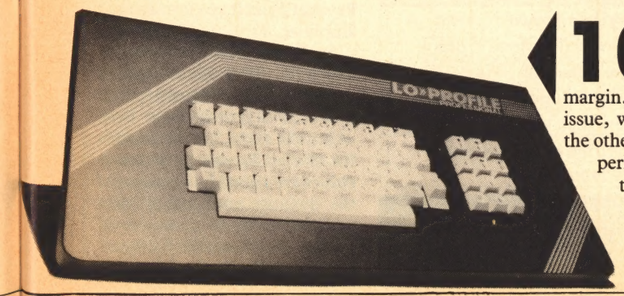
7 Currah Speech Synthesizer (priced £29.95): one of the cheapest and one of the best of the speech synthesizers. We had a full review of them in *Sinclair Answers* No1. There is no speaker inside this unit as it uses the sound from your TV. There are now quite a few games that are compatible with this unit, but you may require the micro-slot interface (an extra £14.95) before you can use some joysticks or other peripherals.

8 dk'tronics Light Pen Interface (priced £19.95): this includes a light pen and some software to help you draw lines, circles, boxes, arcs, or whatever. You can also colour in your drawings, insert text and draw freehand. You can write your own programs to use the facilities of the light pen, but it's a pity there isn't a selection of games that are compatible with it.



9 Sinclair Interface One (priced £45.00): the all important interface if you wish to use Microdrives. It's probably better to buy Sinclair's Expansion pack, that comes complete with a Microdrive and some software, than to get the things seperately (it's priced £99.95). The almost RS232 port included can be used with a printer, but not with a modem, which makes a bit of a nonsense of having it. Also there is two networking sockets, for communications between two or more Spectrums.





10 AMS Low Profile Keyboard (priced £49.95): we understand that this keyboard out-sells its rivals by quite a large margin. In our reviews of nine keyboards in this issue, we found it compared quite favourably with the others, especially on price. As a general rule, and perhaps not surprisingly, it does look as if the purchase price has a considerable effect on sales in the Spectrum market.

dk'tronics,
Unit 6,
Shire Hill Industrial Estate,
Saffron Walden,
Essex CB11 3AQ.
Kempston Micro Electronics,
Unit 30,
Woburn Road Industrial Estate,
Kempston,
Bedford MK42 7AF.
RAM Electronics,
106 Fleet Road,
Fleet,
Hampshire GU13 8PA.
Currah,
PO Box 1,
Gateshead,
Tyne & Wear NE8 1AJ.
Protek,
1A Young Square,
Brucefield Industrial Park,
Livingston,
West Lothian.
AMS,
Woodside Technology Centre,
Green Lane,
Appleton,
Warrington WA4 5NG.

SPECTRUM PLUS



IS THE NEW PLUS JUST A SPECTRUM IN QL'S CLOTHING?

The Spectrum Plus is by no means a new computer: it is more or less a Spectrum in a new box. Although this might appear rather a waste of time, it is a sensible move on the part of Sinclair Research: the Spectrum has sold so well, and the keyboard critisized so widely, that a compatible upgrade makes a lot of commercial sense.

The big, and almost the only, difference between the two machines is the new QL-style keyboard. Not only have the awful spongy old keys gone, but the layout has changed too. There is a space bar, separate cursor keys, two CAPS-SHIFT keys, a separate delete key, two SYMBOL SHIFT keys, separate comma, full-stop, break, edit, graphics, extended mode, semi-colon and quotes keys.

In fact there are 58 keys on the Plus, as opposed to the 40 on the standard Spectrum. Because of the frequent use of such keys as quotes, semi-colons and delete this increased number is certainly welcome. However, in the versions we have received (which are the same as those first put into the shops), there are a few gripes.

First (but not of great importance) is that there is no colour coding of the keys, so if you found that it helped having some key markings in red, some in green, some white, and so on, then you may find having them all in white a little confusing at first. Second, and more important, the keys are prone to fall off when the plus is turned upside down!

We are told by Sinclair Research that they're looking into correcting this, but if you are about to buy one, turn it upside down and give it a little tap. If one or more keys tumble to the floor, wait until the revised model is released.

Although the new keyboard is just sufficiently good to put off people thinking of attaching other keyboards to it, it is still not up to the standards required for touch-typing, at least, it's not a pleasure to touch-type with. Like the QL, the keyboard still has a cheap, tacky feel. Also, most touch typists will be used to controlling the J, K, L, and semi-colon keys in their right hand (these are the 'home' keys for this hand, drummed into typists from the start), on the Spectrum plus the semi-colon is placed elsewhere, and there is no other key between the L and the ENTER key. Because of this we found that it was very tempting to place the right hand over the H, J, K, and L keys, making a hash of it.

Sinclair Research seem so doggedly persistent in getting the keyboard wrong; nevertheless, we suspect most Plus owners will learn to live with it.

The biggest disappointment, though, is that other than the keyboard very few other changes have been made. There is, thank goodness, a reset switch. This is thoughtfully hidden at the side of the keyboard, and spares the user from the hassle of pulling the plug out. Two little legs can be used to tilt the keyboard towards you, which can help a bit.

We also found the sound of the tiny speaker to be a little more coherent. It's not that the speaker has been beefed up at all, just that a few larger holes have been provided for the sound to get out.

The main circuit board is identical to the one in the old Spectrum. It is compatible with all Spectrum software, and no changes have been made to the expansion slots, at least, no functional changes that is. Some of the peripherals produced by independent companies will not work with the Spectrum plus for a very fundamental reason. The physical size of the rear has changed sufficiently that some interfaces (the Kempston printer interface, for example) will not physically fit onto the expansion slot.

It would have been a great boost for this machine if it had just *one* interface in it (a Centronics parallel printer port would have been very welcome); but no. There is not even any joystick ports, so you'll still have to buy extra joystick, printer and Microdrive interfaces.

Without the addition of anything other than a new keyboard and reset switch, the retail price seems a little steep at £179.95. We could have expected a bit more for the extra £50. However, the package does include the six-pack of free software that is now being given away with all Spectrum sales, which is a nice bonus.

The manual that comes with the new machine has been published by Dorling Kindersley, who apparently impressed Sinclair Research with their 'Screen Shot' programming tutorial series. This appears to be aimed more at the complete beginner, includes lots of colour and pictures, and should be a welcome addition to people who buy the Spectrum Plus as their first step into computing.

So all in all, we do not think it is worth upgrading from the Spectrum to the Spectrum Plus. You would probably be better off buying one of the add-on keyboards reviewed elsewhere in this issue.

If you do not have a Spectrum and are considering buying one then the choice is less clear. If you want to be able to touch type with ease, then go for the old machine with a good keyboard. If not, then the Spectrum Plus saves you buying this keyboard and it saves on a sound amplifier.

So, on balance, it is just about worth it. Had there been a printer or joystick interface then it would definitely have been worth the extra; but fortunately for Sinclair Research, both machines are a good buy because of the quantity and quality (of a sufficiently large minority) of the software available for them.

By Peter Turcan, editor.

PLUS SPECIFICATIONS

Price: £179.95 (inc. VAT) on its own; £229.90 with expansion pack (Interface 1, one Microdrive, and some software).
Specifications otherwise identical to the Spectrum except:
Keyboard: 57 'type-writer action' keys, with space bar
Features: Reset switch, legs to tilt the keyboard and improved sound.

THE PLUS IS RECOMMENDED ONLY TO FIRST TIME SPECTRUM BUYERS.

WAFADRIVE



THE WAFADRIVE PRESENTS A NEW ALTERNATIVE IN DATA STORAGE.

The Rotronics Wafadrive is the latest, and strongest, contender for the title of best cheap mass storage system for the Spectrum.

So far there has been little opposition for Sinclair's Microdrive and Interface 1, though its low reliability has always made its position shaky. So much so, that few third party companies have produced software for it; however, this does not seem to be true in the Wafadrive's case.

From the outside in, the Wafadrive is an impressive beast. Although larger than the Microdrive, the Wafadrive is more compact, as it contains two 128K drives. Externally, the design is rather bland, coming as a plain black box. On the front, between the two 'mouths' of the drives, sit three LEDs. The two outside ones indicate when a drive is in operation, while the middle is a power light sourced from the Spectrum.

Three edge connectors protrude from the rear of the box: an RS232 and a Centronics interface, and the largest is a duplicate of the Spectrum's expansion port; so there is still room for other add-ons, such as a joystick, lightpen, or even another Wafadrive unit.

Before you jump for joy over the abundance of interfaces, it should be noted that the use of edge connectors means you will have to buy special cables. But don't fret: Rotronics will supply them at a cost lower than the norm.

After attaching the Wafadrive to the Spectrum's expansion port via a short length of ribbon cable, the system must be initialised. Typing in NEW* hands over most operations to the Wafadrive Operating System (WOS). This works like a Disk Operating System, adding several extra facilities to the basic machine, which are accessed through an Extended Basic (see table on page 12).

The use of Extended Basic commands makes operating the Wafadrive very similar to the Microdrive — not surprising really, as nearly all the commands are already represented on the Spectrum keyboard (the commands in red below, and symbols on, the keys). Although there are a few additions, they are only there for convenience. The three versions of NEW, for instance, allow the Spectrum to be used without a loss of RAM, with the Wafadrive attached. Apart from these, most other differences are merely in syntax, and not in their effect.

All the WOS commands are held in an 8K ROM (like the 8K Sinclair Shadow), located at address 0000 of the Spectrum's Z80 memory map. As this has to share the space with the lower 8K of the Spectrum's 16K ROM, the latter is paged out by intitialising the Wafadrive.

Because the Wafadrive takes up 2K of the Spectrum's memory, Rotronics has made it possible to run the Spectrum with the unit attached, but uninitialised. This means you save precious bytes, but more importantly, can LOAD commercially produced cassette based programs, which use the locations made unavailable by the Wafadrive, into RAM. It also gives the option of loading programs from cassette onto Wafer (your own programs, of course).

Like the Microdrive, the Wafadrive uses stringy floppies for storage. The cartridges themselves, though, are quite different. Looking at a Wafer from the underside gives the impression of two Microcartridges stuck side by side, but that is where the similarity ends. A feature adopted by the Wafer, but missing from the Microcartridge, is a small cover which slides over the tape protecting it from dirt and prying fingers. Rotronics estimate the life of a Wafer as 5,000 passes minimum, and say that with careful use, this can be doubled.

Obviously we could not test Rotronic's claim for the life of a Wafer, but did carry out a test to check the Wafadrive's reliability. A program was written to continually write and read data onto a Wafer, this was then left running overnight. The result was the program was still going in the morning.

Although not conclusive, the test hints at the device's reliability. If, however, this is not reassuring enough, the fact that the drives were originally designed for use in industry by BSR might be.

A Wafer tape, like a disk, must be formatted before it can be used to SAVE data on. The command to do this is FORMAT*"a:name";, where 'a' is the drive and 'name' is the file name. During the formatting process, the screen flashes up several bits of information, giving details on the tape. These are tape length (sectors), number of sectors formatted, ▶

WAFADRIVE SPECIFICATIONS

Drive capacity: 128K formatted.
Tape format: 1 sector equals 1K.
Tape speed: 10 inch/second (read/write); 15 inch/second (search).
Access time: 65 seconds with 16K wafer; 45 seconds 128K wafers.
RS232 interface baud rates: All software selectable. Baud rates are 110, 150, 300, 600, 1200, 2400, 4800, 9600 and 19200.
Centronics interface: Will work with any Centronics printer.
Operating system: 8K ROM; Reserved RAM — 2292 bytes without any open files; Files supported — Program, Machine Code or data files. Maximum number of files 32, or 16 using 16K wafer.
Prices: Dual Wafadrive unit + blank wafer + Special Writer: £129.95 (inc. VAT), 128K Wafer: £3.95; Centronics cable: £9.95; RS232 cable: £9.95.
Software on Wafer: *Heathrow and Nightflight 2* (Hewson Consultants), priced £14.95); *Space Wars, Sei Dab* and *Lunar Attack* (Hewson Consultants), priced £14.95; *World Cup Soccer, Wong's Loopy Laundry* and *Bear Bovver* (Artic Computing), priced £9.95; *Starbike* (Softek International), priced £7.99; *Sherlock* (Melbourne House) priced £14.95; *Mugsy* (Melbourne House) priced £6.95; *The Artist* graphics utility (Softek International), priced £19.95; ZAP Machine Code Development (Hewson Consultants), priced £19.95.

WAFA DRIVES POSE A VIABLE ALTERNATIVE TO MICRODRIVES.

and integral verification facility.

The FORMATting procedure, as well as setting a tape up for receiving data, and writing a directory, also tells the user how many kilobytes are available. As each sector equals 1K (programs are stored in 1K sectors), the capacity of a tape is equivalent to the number formatted. In general, we found a tape to have a larger capacity than indicated. The 64K Wafa, for instance, actually had a capacity of 78K.

Before getting down to SAVEing anything on our formatted tape, we found the best policy was to first LOAD the Wafer's directory (catalogue) into RAM. Not doing this means the first program takes around 30 seconds longer to SAVE than normal (an indication of the differences can be seen in *Fig. 1*). Also included are comparative timings with the Microdrive and cassette. Though the Wafadrive comes out as the slower, which it is, the difference is not as great as shown, the reason being that the tapes used were not of an identical length, and so the timings can only be used as an indication of the facts.

Although we can see how the LOAD/SAVE times of the Wafadrive and Microdrive compare, neither can touch the low access time of a disk drive.

FIG. 1

Timing comparison table:

	Load (sec):	Save (sec):
Cassette:	159	158.1
Micro-drive:	11.8 *	12.44
Wafa-drive:	51.27 (+Cat) 25.30	64.85 (+Cat) 41.95

*The timings in brackets are those taken where the catalogue is LOADed first. A second set were then taken. As mentioned in the text, the lengths of tape used in the Microdrive and Wafadrive are not identical, so the latter appears slower, by comparison, than it actually is.

Another factor affecting the access time of the Wafadrive is the capacity of the tape. There are three sizes of tape: 16K, 64K and 128K. The higher capacity tapes have a higher access time because more tape has to be searched through.

Because the Wafer consists of a continous loop of tape, files have to be stored one after the other (serially); so when a program is searched for, all those before it are skipped over (only their file names being read) until the required one is found. If the program is near the tape head, the access time is low, but if it is at the other end of the tape, the whole length has to be run through. Access times on the 128K Wafer, will therefore be much higher than those on the 16K, because of the difference in length to be searched.

Disk drives do not have this problem, as they rely on random access filing. Random access filing is where the next location to be accessed is unrelated to the previous one. In English, this means the access time is not dependent on the position of the disk in relation to the read/write head (unlike tape). Disk drives can achieve this, because a location is stored along with every filename in the directory. Thus, instead of searching through the whole disk, the device reads the location, and moves the read/write head directly to it.



WAFADRIVE FACILITIES

CAT*"d:" — Displays directory of specified drive.
CAT#"d:" — LOADs in directory as above, but does not display it.
CLEAR* — Clears all open streams and closes any opened data file channels.
CLOSE#stream — Closes streams opened using OPEN#.
CLOSE#*stream — Closes streams opened using OPEN#*.
OPEN#*. Causes data assigned to data files channels to be sent to wafer, and the directory updated.
CLS* — Clears screen and resets attributes.
ERASE*"d:filename" — Removes specified file, reclaiming sectors for later use.
FORMAT*"R";baudrate — Sets RS232 transmit/receive data rate.
FORMAT*"d:wafername" — Prepares blank tape ready for use.
INKEY$#stream; variables — reads next character from open input channel, via assigned stream.
INPUT#stream; variables — Reads data from previously opened input channel, via assigned steam.
LIST#stream, line — Lists program.
LOAD*"d:filename" — Loads specified program whether Basic or Machine Code.
MERGE*"d:filename" — Merges specified Basic program with that currently in RAM.
MOVE*"d:filename1" "TO"d:filename2" — Makes a copy of file specified in filename1, giving it the name specified in filename2.
NEW — Clears Basic program and resets WOS, handing used RAM back to Spectrum.
NEW* — Initialises WOS.
NEW# — Clears Basic program area without resetting WOS.
OPEN#stream, "channel" — Opens specified stream and assigns it to channel.
OPEN#*stream, "port" — Opens specified stream, and assigns it to specified port channel.
OPEN#*stream, "d:filename" — Opens tream and assigns it to data channel.
PRINT#stream; "string",data,variables — Sends string or numeric data to an open output channel.
SAVE*"d:filename"LINErun — Saves Basic program in memory. The line suffix makes the program auto run when loaded.
SAVE*"d:filename",start,length,run — Saves machine code bytes from memory.
SAVE# — Over-writing existing files with same name.
VERIFY"d:filename" — Verifies Basic or machine code program with that stored in RAM.

A program can be SAVEd in one of several ways, depending on whether it is written in Basic or Machine Code. SAVE*"a:filename" will SAVE a Basic or program, but if it is required to autorun when LOADed, LINE n (where n is the line number) can be added after the final quote marks ("). LOAD has the same syntax. Machine Code programs are SAVEd using the syntax SAVE*"a:filename",s,1; where 's' is the start location, and '1' the length. As you can see, the WOS does away with using the CODE statement.

So far we have only looked at storing programs, but it is also possible to store data files. These are files which contain, for instance, lists of words or numbers.

Data files are unlike 'normal' files, in that data cannot be sent directly to them: a stream has to first be opened and assigned. A stream is simply the route by which data is sent to a channel, which in this case, is a specified drive. OPEN#* is used to open a file. OPEN#*4,"a:filename" opens a stream. It has no initial effect on the Wafer, but instead reserves a 1K buffer in the Spectrum's memory. Until this is filled, nothing is sent. Data can be written to the open file using PRINT#stream number-;"data". Once the buffer is filled, and the user is sure that he wants to send it to the Wafer, the transfer can be completed with CLOSE#*4. Nothing can be written to the Wafer until the file has been closed. The whole operation can be likened to a filing cabinet, where a file is taken, opened, filled, closed, and put away.

To complete the package, Rotronics has included a copy of Softek International's *Spectral Writer* word-processor, a program equaling *Tasword* in most departments.

As far as the Wafadrive versus Microdrive battle goes, the result is a knockout for the Wafer. Although it is slower, its reliable drives provide a far better option, which means there could be much more software available for it. Rotronics have, as has happened before, out-Sinclaired Sinclair.

By Steve Applebaum, staff-writer.

Rotronics,
Santosh House,
Marlborough Trading Est,
West Wycombe Rd,
High Wycombe,
Bucks HP11 2LB.
Tel: (0494) 452757.

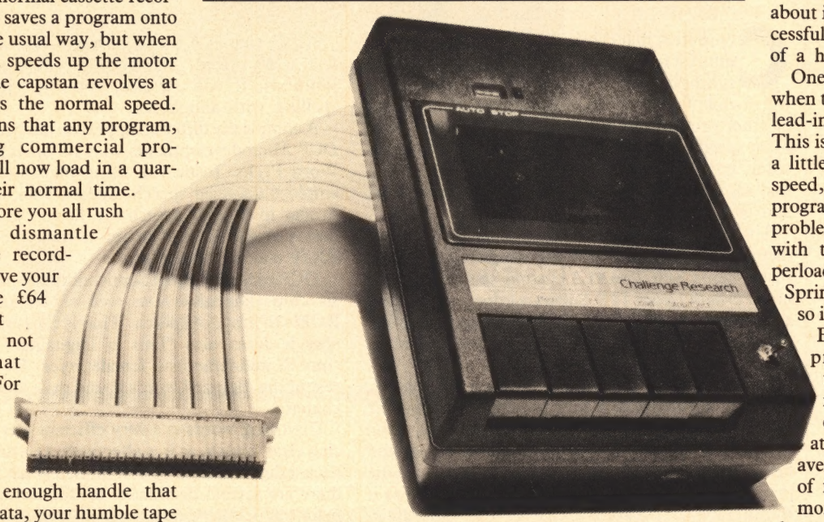
SPRINT RECORDER

THE SPRINT DATA RECORDER CAN SAVE AND LOAD YOUR PROGRAMS IN A QUARTER OF THE NORMAL TIME

Updating your storage system from tapes to disks can be quite a costly step: not only do you have the expense of buying the disk interface and disk drive(s), but you'll also have to replace most of your now redundant tapes — it's unlikely that you'll be able to transfer them all.

Challenge Research have tried to solve this problem with their new Sprint Data Recorder. In essence, its operation is very simple: a normal cassette recorder which saves a program onto tape in the usual way, but when reloading, speeds up the motor so that the capstan revolves at four times the normal speed. This means that any program, including commercial programs, will now load in a quarter of their normal time.

But before you all rush away to dismantle your tape recorders, and save yourselves the £64 the Sprint costs, it's not really that simple. For a start, although your Spectrum is quick enough handle that speed of data, your humble tape recorder certainly isn't: as soon as you increase the cassette speed, which must be done precisely using a special motor, you also increase the dreaded residual noise, wow and flutter — bad language to any hi-fi enthusiast.



One of the main ways in which the Sprint is able to alleviate this problem is to bypass the normal MIC and EAR sockets. All the tape signals are handled internally, converted into a data stream, and sent along the connector as a pattern of bits very quickly. This has the added advantage that you needn't worry about volume or tone controls, and no more warning alarms when you try to save a program with the MIC connected.

The Sprint looks similar to most recorders, with the normal array of Save, Rewind, Fast Forward, Load and Stop/Eject buttons along the front. There are, however, two very noticeable differences: first, there's no speaker; and second, there's a large multicoloured ribbon cable emerging from the side.

Rather than using the usual MIC and EAR sockets, the ribbon cable plugs into the Spectrum Expansion port. The data recorder has a through port, so you needn't worry about all your other peripherals.

At this point we have our first minor criticism: the ribbon cable supplied is only about eight inches long, and has to have a 90 degree twist in it to fit properly. This means that you have no choice but to position the Sprint to the back right-hand side of your Spectrum; in addition to this, the through port is on the back of the Sprint, so any other peripherals are going to extend even further into the distance along your desk top.

In case anybody has just updated to Microdrives, but would still be attracted by a fast method of loading all their old cassettes, then a toggle switch near the front of the machine allows for Microdrive compatibility. Simply flick the switch, and your Spectrum will access either the Microdrives or the Sprint.

So, now you have a motor spinning at four times faster than normal, ensuring that all programs load four times as quickly; but unfortunately, this is not always the case, and, whatever the advert may say about improved reliability, successful loading tends to be a bit of a hit and miss affair.

One known problem occurs when there is not a long enough lead-in before the program. This is because the motor takes a little while to rev-up to full speed, and thus messes the program header block. Another problem you're likely to have is with the new Spectrum 'Hyperload' programs, which the Sprint is not compatible with, so it won't load any of them.

Even allowing for these problems, the Sprint tended to be rather unreliable. For example, even after repeated attempts, it was only on average able to load two out of five programs from this month's Spectrum games chart — not a very impressive record for a device which is going to cost you well over double the price of a normal cassette recorder.

The review model we were given was a Mark Two Sprint, but there are obviously still a few problems to sort out. Eventually, even Rewind and Fast Forward decided to give up on our particular model.

This could be an excellent product, and it is possible that we just got a duff review machine. If you really want to try it out for yourself, Challenge Research have informed us that they will replace any faulty Sprint, by return post if possible, and their advert claims a money back guarantee if returned within seven days. In conclusion, we think we'll wait for the Mark Three version; as it stands, the Mark two is not too recommended.

By Marcus Jeffery, technical writer

SPRINT SPECIFICATIONS

Price: (Mark II) £69.95 (inc. VAT).

Features: Microdrive compatible; uses standard Spectrum expansion interfacing

Dimensions: 200 × 59 × 135 mm.

Baud rate: 4600 (approximately)

SPRINT IS A USEFUL MACHINE, BUT STILL HAS TEETHING TROUBLES TO OVERCOME.

Challenge Rersearch,
218 High Street,
Potters Bar,
Herts EN6 5BJ.
Tel: (0707) 44063.

THE GIFT OF THE GAB

AN UPDATE ON WHAT PRODUCTS ARE BEING TALKED ABOUT IN THE SINCLAIR SYNTHESIS MARKET.

Computers that can 'talk' attract a good deal of interest from users, and our last look at speech synthesis caused enough of a stir to make it worthwhile following up, especially since a number of other products have subsequently come to light. Most speech peripherals are aimed at the 48K Spectrum, but reviewed here are a number of products that are compatible with the ZX81, 16K Spectrum, and even the QL.

The interesting point is that this time not one of them uses the previously all-conquering General Instruments SP0 256-AL2 custom speech chip. In fact *Varitalk* (from ITS Software) does not require any extra hardware at all — an amazing feat considering that the ZX Spectrum possess only a single BEEP sound channel.

Swallowing our disbelief, ITS's tape was loaded, and after approximately four minutes it greeted the listener with the sound message 'Varitalk has been loaded and is ready for use', actually we've cheated here, because later in the day a look at the instructions revealed what it had said — otherwise it would have been very difficult to tell. The screen then reverted to the standard Sinclair Research logo. At first we assumed that there had been some loading error. In fact, all was working properly. At this point the user is supposed to load the demo program, which we duly did. The results were a pleasant surprise.

The program prints an introductory message to the screen at the same time as the micro speaks which, as we have found in the past, is the most effective method of employing speech generation. The words produced are intelligible once the initial unfamiliarity has been overcome, but the voice does tend to sound as if it is slightly out of phase giving a rather echo-like effect. Although the instructions don't actually recommend it, using an external speaker / amplifier does improve the clarity of the speech produced.

There are 54 allophones available using *Varitalk*, which is lightly less than most other speech peripherals give the user. For the uninitiated, allophones are parts of speech made up from smaller units known as phonemes. Breaking down speech into a phonetic code is a well known technique borrowed by programmers from linguistics.

Programming the Spectrum to use *Varitalk* is relatively easy. To persuade it to say 'hello' simply requires the following to be keyed in then RUN:

```
10 LET T$="H1E3L201"
20 RANDOMIZE USR 33600.
```

Important points to remember when programming *Varitalk* are to use upper case letters and ensure that the inverted commas are included. The art of using phonemes is to spell words as they sound, not literally; for example, *Sinclair Answers* translates to S1I1N1K3L1A2Y1R1 A3N1S2E4R1Z2. Should you wish to utilise *Varitalk* with one of your own games, use CLEAR 33599 after loading *Varitalk* and before loading the game.

At £5 (inc. VAT and postage), *Varitalk* is very reasonably priced, and a good introduction to speech synthesis. If nothing else, you'll get the hang of spelling with allophones.

A completely different approach has been taken by DCP Microdevelopments with its Speech Pack and Word Packs. Instead of using phonemes this unit employs digitized speech. Speech Pack is therefore similar to Acorn's speech synthesizer and Commodore's Magic Voice. The unit is compatible with the ZX81 and all Spectrums.

DCP uses a National Semiconductor voice synthesis chip (Digitalker), as well as National's word ROMs to produce speech. That is the reason why its speech demo says 'This is Digitalker' in a silky smooth mid-American female voice. However, the rest of the digitized words sound male and cannot be changed.

Digitizing words is a very efficient way of producing clear speech, as it is effectively a form of playing back a digital recording of a human voice. However, there are several drawbacks to this technique. The main one is the resulting small vocabulary through lack of ROM storage space. Allophones, on the other hand, provide an almost unlimited vocabulary. Speech Pack's attempt to remedy the situation is by providing a number of digitized letters and phonemes to enlarge the vocabulary. Immediately you try to employ such methods user-friendliness and clarity are sacrificed. DCP claim its instructions are deliberately brief to avoid such confusion, relying on the user to experiment.

It is possible to combine certain words with the phonemes provided. For example no.32 'ed' could be added to no.22: 'correct' to produce 'corrected', if timed correctly using PAUSE. Another example is no.118: 'parenthesis'. Skillfully employing one of the four periods of silence (nos.67-71) will cut the word short and thus sound like 'parent'. There are a couple of tones included that sound like bleeps which could be used in your own game if so desired.

The base price of DCP's Speech Pack is £29.95 to which an additional three Word Packs can be added. This brings the price up to £68.80. Although it is not essential to have all three Word Packs, we'd recommend it in order to get the best out of the unit. Using all the Word Packs provides a total of 273 words and sounds.

One gripe over the Digitalker is that certain included words are virtually redundant. How often do you need to say 'farad' for example? Better use of the available storage space could be made. DCP doesn't even include 'alien attack' in its vocabulary. It will be interesting to see what facilities the next version of Speech Pack has when released.

At the other end of the price spectrum are two speech synthesizers which use the Votrax speech system known as Type 'n' Talk. We tried out one from Namal Associates which is compatible with any micro (provided it has an RS232 interface). For our purposes the *Specterm* communications program (published in *Sinclair Answers* No 1) and a Cobra RS232 interface were used. In effect, any Sinclair micro could be used with Type 'n' Talk.

The results were very good. All that is required from the user is to type in straight text and ENTER. Type 'n' Talk then says the words. The unit has a Z80 processor and inbuilt dictionary which help it cope with standard words. For instance, it copes with 'enough', but not 'plough'. To overcome such instances a certain amount of cheating can be used, such as spelling plough as 'plow', which is where experience with allophones comes in useful!

Type 'n' Talk is one of the easiest to understand speech synthesizers — as it should be, with a price tag of £171.35.



Type 'n' Talk is one of the easiest to understand speech synthesizers we have come across, and so it should be since it costs £171.35 (inc. VAT). Criticism's we have were with volume, as it was a little quiet despite a volume control. Another gripe is that writing the software to control Type 'n' Talk is left up to the user (although a reasonable manual is provided). Making up a cable would be a necessity for the average Sinclair owner, and we'd guess a knowledge of communications would come in handy in order to set Type 'n' Talk's internal dipswitches. Setting up is, however, covered by the manual.

The puzzling thing is that another company, Cyber Robotics, also sell the Type 'n' Talk system for £316.25 (inc. VAT). The difference being that Namal use the Votrax chip but provides its own casing and circuitry, while Cyber markets a complete Votrax unit. Cyber also sells an up-market version of the unit, costing over £400, which it calls the Personal Speech system. Extras include an inbuilt speaking clock, the ability to play music or sing, and a pronunciation reference table which can be used to extend the existing dictionary.

As a footnote to our previous article on speech synthesis we have discovered that an English-to-allophone dictionary does already exist. Currah has produced the dictionary for its uSpeech owners. The cost is £3.50 (inc. VAT), and it includes some 2,140 words. And while on the subject of the uSpeech unit, Currah now has made an extension to the uSlot Spectrum motherboard (priced £3). The extension means that clearance between the Spectrum and joystick interface is now adequate.

By Tony Dennis, deputy editor.

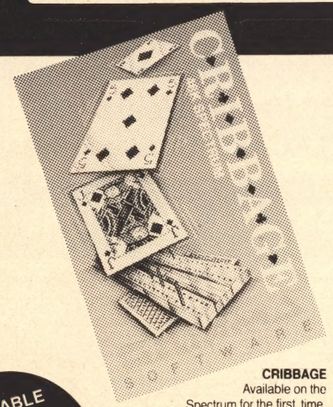
Personal Speech system (priced £431.25 inc. VAT) is available from:
Cyber Robotics,
1 Ditton Walk,
Cambridge CB5 8QZ.
Tel: (0223) 210675.

ZX81/Spectrum Speech Park (priced £29.95 inc. VAT) plus Word Pack (priced £12.95 each) are available from:
DCP Microdevelopments,
2 Station Close,
Lingwood,
Norwich NR13 4AX.
Tel: (0603) 712482.

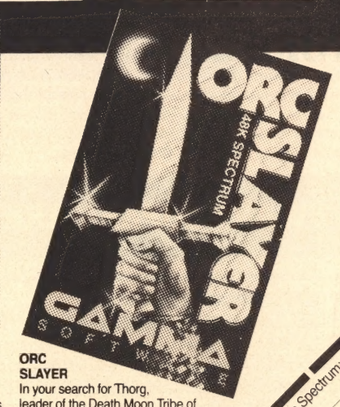
Varitalk (priced £5 inc. VAT) is available from:
ITS Software,
25 Park Street,
Cirencester,
Glos.

Type and Talk (priced £171.35 inc. VAT) is available from:
Namal Associates,
153-154 East Road,
Cambridge CB1 1DD.
Tel: (0223) 355404.

Unbeatable value.
Almost unbeatable games.







AVAILABLE THROUGH LEISURESOFT, CENTRESOFT AND ALL GOOD RETAILERS

CRIBBAGE
Available on the Spectrum for the first time. **CRIBBAGE** is an excellent version of the popular card game. As well as superb graphics, the game includes full rules and playing instructions together with automatic scoring and score re-view.

Playing against the computer, the experienced player and novice find **CRIBBAGE** an entertaining and challenging game.

MADHATTER
"I must get this place tidied before my guests arrive," wails the **MADHATTER**. Help him collect his tea time treats for his Un-Birthday Party. "But watch out for those mice" he warns, "and keep away from those vacuum cleaners!"

Looks like the **MADHATTER** will be in for a busy afternoon – will everything be ready in time?

GAMMA SOFTWARE

ORC SLAYER
In your search for Thorg, leader of the Death Moon Tribe of Orcs you must first find the Magic Runesword needed to destroy him and then seek out their underground stronghold somewhere in the Savage Lands.

Full of excitement, this adventure will push you to the limit of your wits and intelligence in achieving your goal.

Please send me the following games for the Spectrum:
MADHATTER 48K @ £5.50
ORC SLAYER 48K @ £5.50
CRIBBAGE 48K @ £5.50
Total Including Postage: £
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Address
WM10
GAMMA SOFTWARE, 12 Milverton Rd, London NW6 7AS

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TIR NA NOG *"The plot has everything an adventurer could want and the graphics are amazing... if you have to buy one game, this could get my vote (PopCompWkly).* Your hero is 56 pixels tall. You explore, hair waving in the wind, clouds moving in the sky, birds flying - absolutely beautiful animation. NO STICKS. **(Gargoyle) £9.95**

SKOOL DAZE *"HILARIOUS (and very difficult) school romp... highly original game, which looks set to become another monster hit" (Crash).* Latest from the 'WHEELIE' people has you robbing the school safe to get your Report, catapulting the masters, avoiding the school bully and it's all in very well-drawn graphics indeed. The most fun we've had since school. STICKS: Kempston, Interface2, Cursor. **(Microsphere) £6.95**

REDCOATS For fans of 'Johnny Reb' and all historical adventures. Graphic wargame as you fight 5 battles in the American War of Independence. Choose your battle, even customize the armies. Unique LOAD your own battles feature, too. 9 skill levels. Endless entertainment. NO STICKS **(Lothlorien) £6.95**

KUNG FU THE FIRST ANIMATED PERSONAL COMBAT GAME! For 1 or 2 players. Faithfully reproduces the movements and blows of Kung Fu using very large, cleverly animated fighters. You can replay each bout - which helps you to learn. A great change and beautifully executed. STICKS: Kempston, Interface2. **(Bug-Byte) £6.95**

FULL THROTTLE *"As addictive as any race game on the market... a hair-raising version of the Grand Prix 500cc TT Racer" (Sinclair User). "Totally amazing... the animation of the bikes and the perspective FX are quite brilliant" (Big K).* Choose your circuit (from 9) as you prepare to race your Grand Prix bike. Choose your laps. Then take on the field. Total realism. STICKS: Kempston, Interface 2, AGF. **(Micromega) £6.95**

EUREKA! *"Animated graphics and video-style split-screen techniques make EUREKA! a visually interesting game as well as an entertaining adventure" (Comp&VidGames).* 250K of program! Solve 5 adventures and arcade games and word-and-picture puzzles (full-colour manual) to find the secret phone number and win £25,000. (If no-one wins by Xmas '85, everyone shares the prize!). STICKS: Kempston, Interface2. **(Domark) ONLY £13.95**

PAINTBOX *"I've never had so much fun with a utility program.... I think you'll find it's the best £7.70's worth you've ever spent" (ZX Computing).* Even a child can use this Paintbox, but adults can get amazing results, too. DEMO. Define up to 84 User Definable Graphics. 2-speed hi-res drawing program. Drawing board, sketch pad, 28-page manual. STICKS: Kempston, **(Print 'n' Plotter) £7.70**

TASWORD 2 *"If you have a Spectrum and wish to do word processing on it, you could hardly do better than to use Tasword 2.... simply excellent" (PersCompNews). "The number of on-screen prompts, together with the excellent manual, make it ideal, even for an absolute beginner" (PersCompWorld).* Prints 64 characters per line on your screen and drives most printer interfaces. Text printed as you see it on the screen. Useful Tasword Tutor included. The classic Spectrum word processor. NO STICKS. **(Tasman) £13.90**

SHERLOCK *"Sophisticated, rich in atmosphere and amazingly detailed. SHERLOCK is a game which no Spectrum owner will want to be without... a great adventure" (MicroAdventurer).* Does for Conan Doyle what 'The Hobbit' did for J.R. Tolkien -and it's written by the same programmer. 800 word vocabulary and graphics, too! NO STICKS. **(Melbourne House) £14.95.**

DARK STAR *"Try as I may, I can't think of a better arcade game for the Spectrum." (PersCompNews).* Claims to be the longest single-load program ever written for the Spectrum. 256 sectors of galaxy to fly around zapping. 6 skill levels. And CUSTOMISE feature. STICKS: Kempston, Interface2, Cursor. **(Design Design) £7.50.**

DEUS EX MACHINA *"Ten out of ten for a program which surpasses everything on the market at the moment." (SinclairProgs) "The computer equivalent of Pink Floyd's THE WALL - you must take a look at it." (C&VG).* Load the program, then load the sound cassette which synchronises music with your playing. Stars Jon Pertwee, Frankie Howerd, Ian Dury - and Mel Croucher! STICKS Kempston, Interface2. **(Automata) £15.00.**

SYSTEM 15000 *"AN ABSOLUTELY WONDERFUL IDEA...ARTIFICIAL HACKING/System 15000 closely mimics a vast number of different databases and you have to hack your way around discovering passwords." (PopCompWkly) "I recommend you play this game if you can. It could become a cult game in years to come." (YrComm)* NO STICKS. **(Craig) £9.95.**

COMPLETE MACHINE CODE *"THE BEST MACHINE-CODE TUTOR...no serious Spectrum programmer should learn machine-code without it." (Crash!) "Simple to use...the lessons are comprehensive enough to help even the beginner...an excellent introduction to assembly language...very user-friendly." (Sinclair User).* Over 70K of data loads in 4 parts from 2 cassettes. Helpful manual. NO STICKS. **(New Generation) £14.95.**

NEW! NEW! NEW! NEW!

At press-time, we have just received the following programs which look great. No reviews yet - but they're all in stock.

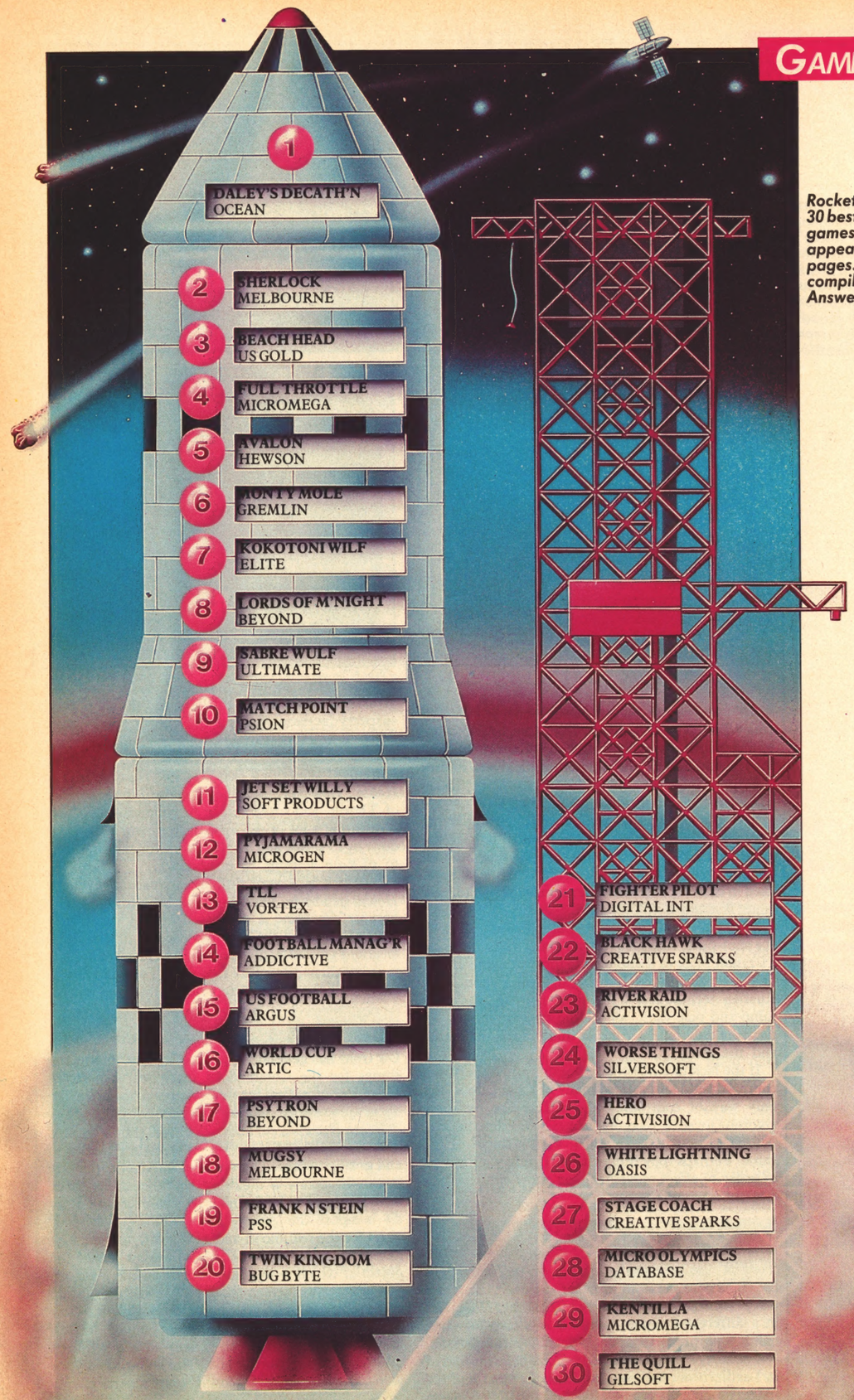
D-DAY (Games Workshop) £7.95
BACKPACKERS (Fantasy) £7.50.
CYCLONE (Vortex) £6.95
KNIGHT LORE (Ultimate) £9.95
HAVOC (Dynavision) £7.95
BATTLECARS (Games Workshop) £7.95

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Post to: SOFTWARE SUPERMARKET (SU26)
87 Howard's Lane, London SW15 6NU, England.
For CATALOGUE ONLY, send £1 cash. Refunded with your first order. I own a **48K Spectrum.** I enclose a cheque/PO payable to Software Supermarket
OR Charge my VISA/ACCESS/EUROCARD/MASTERCARD

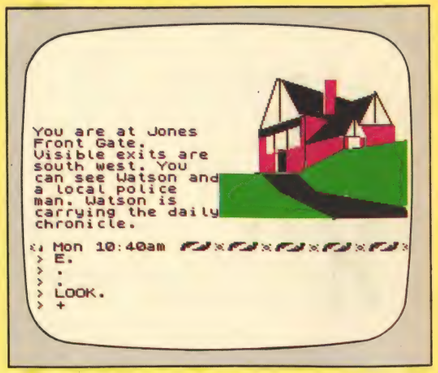
Signature:
Please write clearly. If we can't read it, you won't get it.
Name
Address
.....
.....Postcode
PHONE NO:, if any, in case of query SA 2

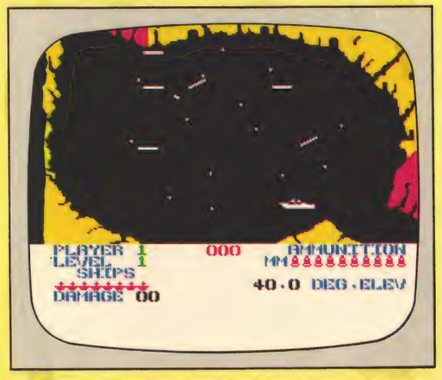
Program	Price
Postage & Packing UK add 75p per order	
Europe ADD £1.00 per program	
Outside Europe ADD £ 1.50 program	
Total Order	

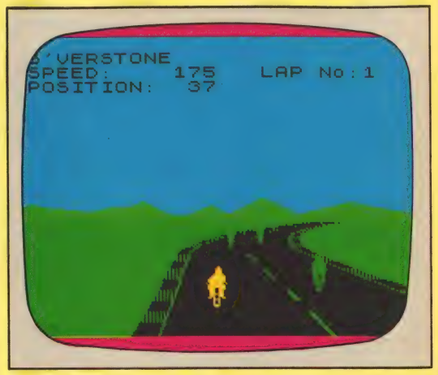


Rocketing to the top: the 30 best-selling Spectrum games. A review of each appears on the following pages. The chart was compiled for Sinclair Answers by RAM/C.









Clockwise: albino Daley sprints for the finishing line in Ocean's 'Daley's Decathlon'; reaching the scene of the crime in 'Sherlock'; hazardous navigation from 'Beach-Head'; high-speed thrills from 'Full Throttle'.

1 DALEY'S DECATHLON

Daley Thompson's Decathlon, from Ocean, is another of those dull, and rather pathetic attempts at putting the feel and excitement of track and field on a micro. It is hard to see why (apart from the money) Daley Thompson put his name to this one.

The first thing that strikes you, when playing *Decathlon*, is the question of whether or not the game's writers have ever watched athletics, because although the events are all correct, the technique used in each is not (even Daley himself seems to have gone through a colour change).

The lack of realism is particularly demonstrated by the shot-putt, which has albino Daley running along a straight piece of track, only to throw the implement like a javelin (what has Ocean heard about new Russian techniques?); the same goes for the high jump and pole vault: all use the straight run up. In fact, the only saving grace of this game is the discus and the music.

If the lack of authenticity doesn't put you off, the controls could. As with so many of these games, the only way of controlling the athlete are by some vigorous joystick waggling or keyboard destruction, neither of which really enhances enjoyment of the game. Perhaps they think that straining your biceps in order to effect movement somehow emulates the real thing.

2 SHERLOCK

Sherlock, the long awaited follow-up to *The Hobbit*, has finally arrived, and proven to be everything that was promised. Far from being just another *Hobbit* set in a different location, *Sherlock* is a leap forward, making its predecessor look dated by comparison.

The story is simple: two ladies have been murdered in Leatherhead, and you, as Sherlock, must find the killer. Of course, your trusty assistant Watson is on hand to help, as well as Inspector Lestrade and Straker. But as the plot thickens and the number of suspects increase, finding the culprit seems more unlikely at every turn.

It is possible to talk to characters in multiple sentences, something that was not possible in *The Hobbit*. However, many have retained the ignorance of Thorin, and often refuse to communicate. This means that a lot of the investigatory work has to be done by Lestrade and Straker, with you tagging along to pick-up snippits of information.

Sherlock is a very difficult adventure, even by *Hobbit* standards. There is no free book to fall back on because the game is not based on any one Conan Doyle story, and the graphics used to illustrate the locations give little information. As a result, Sherlock is an excellent adventure that should appeal more to the hard bitten adventure veteran than the novice.

3 BEACH HEAD

US Gold has generally confined itself to producing games for the Commodore machines, but *Beach Head*, one of its first for the Spectrum, has proved to be an interesting and worthwhile departure.

Beach Head is a cut above the usual shoot-'em-ups the difference being its interesting scenario and great graphics. There are seven screens, the first screen is merely a menu to allow joysticks to be selected, keys to be defined, or whatever; the other six compose the game itself.

As for the real blood-and-guts stuff, you get a bit nearer that on screen two. This is the Map Screen, the object of which is to guide your fleet into a hidden passage (see the screen shot above) which makes up screen three. Here you have to move your fleet through drifting rocks, torpedoes and mines. It is not easy, but the next screen makes all the required joystick jittering worthwhile. The reward is a view along the barrels of a cannon onto several enemy ships.

Daley's Decathlon (price £6.90) is available from:
Ocean Software,
Ocean House,
6 Central St,
Manchester M2 5NS.
Tel: (061) 832 6633.
Sherlock (priced £14.95) is available from:
Melbourne House Publishers,
39 Milton Trading Est,
Abingdon,
Oxon OX14 4TD.
Beach Head (priced £7.95) is available from:
US Gold,
Unit 24,
Tipton Trading Est,
Bloomfield Rd,
Tipton.
Tel: (021) 359 3020.







Far left: baroque scenes from 'Avalon'; left: Monty Mole prepared to go underground; below: Neanderthal jinks from 'Kokotini Wilf'.

Very soon you are under attack. Planes take off from enemy carriers and fly over your fleet, dropping bombs. Graphically this phase is great, though it does go on a bit. Battle Stations, the next screen, has the same scene, without aircraft. Instead the ships fire, their shells falling into the sea with a spray of white foam.

The last part has the fitting title of the Final Battle. Here you must fire at ten white targets, which, when destroyed, cause a big explosion and the enemy to surrender.

Beach Head stands out in the areas of both graphics and theme, and should grace any Spectrum software collection.

4 FULL THROTTLE

Full Throttle is a loosely disguised version of Atari's *Pole Position*: but instead of racing cars, Micromega has used motorbikes.

The game itself is not too exciting, being no more than a track race againt 39 other riders; but the graphics, which comprise of a neat 3D view along the track onto the other bikes, just saves it from disappearing into obscurity.

As a newcomer to the racing game, your man is positioned at the back of the starting grid, with a wall of riders blocking the forward view. This is a minor worry, because as soon as the race starts, they are off and away, hardly to be seen again. Throughout the rest of the game you must try to weave, swerve and lean your way into a good position. Apart from crashing into another rider, there is the hazard of skidding from cornering too quickly; stop, and you soon get left behind.

A lot of work has obviously gone into the game's graphics but in the end it is merely lack-lustre. After a few plays, and a lot of frustration at only coming 38th, the only thing that we felt like throttling was our Spectrum.

5 AVALON

Avalon (from Hewson Consultant) is claimed to be an adventure movie. Although the graphics have a film like quality, they do not merit the grandoise appellation thus bestowed. That aside, Avalon is certainly different, offering arcade action within an adventure-type setting.

You play the part of Maroc, a wizard. The aim of the game is to guide Maroc through a labrynth of rooms (223 in all) and levels, picking up spells and objects as you go. By collecting the right things, you are able to descend to the eigth level and the final encounter with the Lord of Chaos.

Although there is a marked resemblance to Ultimate's *Atic Atac*, graphics save it from becoming just another copy. The movie claim comes close to fruition in the way Maroc moves and the screen smoothly scrools in almost any direction. Doors can be swung open and closed, as can boxes and chests.

Of course, no adventure would be complete without nasties to battle with, *Avalon* has many of these — so many in fact that we were unable to reach below the first level, and descend on our journey to the eighth.

Hewson Consultants has created an odyssey of colour and sound which, although in the same genre, supersedes the likes of *Atic Atac* by a long way.

6 MONTY MOLE

Following in the footsteps of *Manic Miner*, *Monty Mole* has you trekking through pits and collecting coal to keep you warm during the long winter.

Picking up the bucket, Monty disappears down the mine, finding and collecting chunks of coal, while trying to avoid flying pickets, fish, hairsprays and other assorted oddities. Having finally filled our bucket, you escape, only to find yourself in Arthur's castle. No, not Camelot — this is a present day Arthur, with certain political overtones. Your only way to succeed here is to dash about collecting the secret ballot papers and vote-casting scroll.

The graphics are colourful and smooth, though the sound leaves a lot to be desired. Nevertheless, this is an enjoyable and addictive game, whatever your political views.

7 KOKOTINI WILF

Wilf, of the title, is a Neanderthal flying man. You must control him using left, right and fly as he journeys across primeval landscapes and dangerous caverns. In typical *Manic Miner* fashion, Wilf — or rather a number of Wilfs, one for each life — is attacked by nasties including bats, man-eating ▶

Full Throttle (priced £6.95) is available from:
Micromega,
Personal Computer Division,
Quantec Systems & Software,
230-236 Lavender Hill,
London SW11 1LE.
Tel: (01) 223 7672.
Avalon (priced £7.95) is available from:
Hewson Consultants,
56B Milton Trading Est,
Abingdon,
Oxon OX14 4RX.
Monty Mole (priced £6.95) is available from:
Gremlin Graphics,
Alpha House,
10 Carver Street,
Sheffield S1 4FS.
Tel: (0742) 753423.
Kokotoni Wilf (priced £5.95) is available from:
Elite Systems,
55 Bradford Street,
Walsall SW1 3QD.
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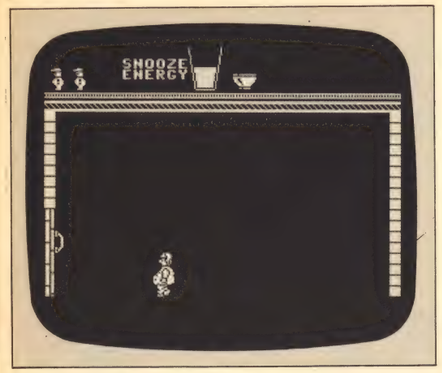
"Game for a lot" **DAILY MIRROR.**

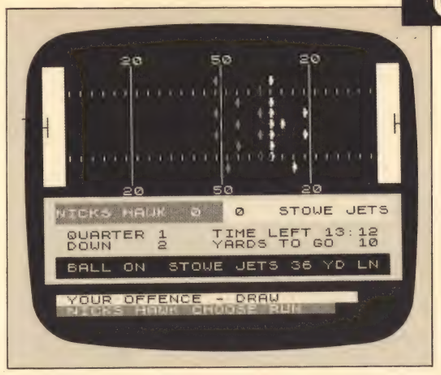
"In this World's oft fruitless search for value for money, a new software package from Domark shouldn't be ignored" **YOUR SPECTRUM.**

Eureka!

IS HERE

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Far left: Wallyness from 'Pyjamarama'; left: flea-scale action in 'American Football'.

fish, pteradactyls, and assorted dinosaurs. During your travels, you must collect a number of 'items' which add to your score.

The graphics aren't bad, but the lack of screens in the cave system was a little disappointing, and after the first couple of abortive flying attempts, the game became rather easy. Not highly recommended, but it may appeal to some.

8 LORDS OF MIDNIGHT

The Lords of Midnight, which we reviewed fully in the first issue of *Sinclair Answers*, is already dropping in our charts. Giving 4,000 locations and a staggering 32,000 views, the program looks like an expansive adventure, but plays more like a tactical wargame. Recommended for adventurers and wargamers alike.

9 SABRE WULF

Top of our last Sinclair chart, this is still a highly recommended game. Scurrying through the large jungle maze, fighting off all manner of beasties, you must collect parts of a map which will lead you to the ultimate treasure — the Golden Amulet. Excellent graphics and sound, and a high level of difficulty will keep you amused on many safaris.

10 MATCH POINT

Hot from the centre court, *Match Point* is still just in the top 10 boundary line since our review in *Sinclair Answers* No 1. The perspective graphics and variety of playable shots ensure a very realistic game, which is recommended for all budding armchair tennis fans.

11 JET SET WILLY

Falling only slightly since our last review, *Jet Set Willy* is still clearing up after his high flying party. This well known sequel to *Manic Miner* has been around a long time now, and is still great fun to play.

12 PYJAMARAMA

This arcade adventure has you helping out some pyjama-enclothed bloke called Wally, who is supposed to be a bit of a wally as, er, his name might, er, suggest. As the story goes, Wally has fallen asleep and is having some terrible nightmares. We couldn't find any hoof prints, but we did find ourselves controlling Wally who was wandering about his house, picking up various objects in a desperate attempt to find and wind up his alarm clock so that he can wake himself up (know the feeling?).

Wally's house is quite large, giving plenty of screens with excellent graphics. There are lots of objects about, including beach balls, towels, door handles, keys and other oddities, all larger than life — a side effect of the nightmare. One other side effect causes the appearance of lots of nasties which bare more than a passing resemblance to household objects.

An interesting story line (if a little close to *Jet Set Willy*), very good graphics and numerous screens ensure that this will be a game with lasting appeal, not the sort of game you can play in *your* sleep.

13 TORNADO LOW LEVEL

Number three in our charts when it was reviewed in the first issue, this particular Tornado is dropping fast. Though having excellent psuedo-3D graphics as you pilot your jet over the scrolling landscape, the game lacks action and lasting appeal.

14 FOOTBALL MANAGER

Though we found the action slow and uninspired when we reviewed the game in issue one, *Football Manger* is certainly moving up in our league. As manager, you must make all the important decisions concerning your club, before watching your team of stick men perform on the pitch.

15 AMERICAN FOOTBALL

Third down and six yards to go on the Automatons 20-yard line. Three points down and the seconds ticking away in the fourth quarter . . . this is the world of *American Football*.

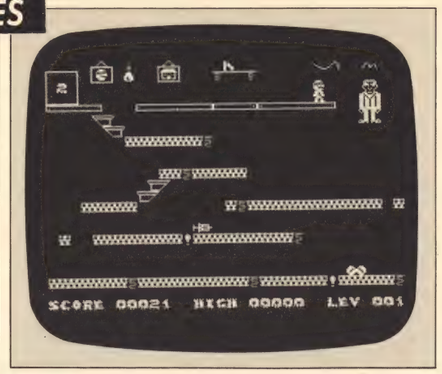
The tape comes with a 16 page manual, describing the rules of the game, the jargon used and how to play the program. Options allow you to either play the computer or play between two people, and you may choose the names of both teams. Playing the game involves choosing your strategy (offence or defence) at each stage of the game, then watching the little flea-like characters dash about the pitch at the top of the screen as the play is made. There are eight offensive plays, including Shotgun, Pocket, Sweep and Reverse, and four defensive plays. In addition, three types of kick are allowed for different positions.

Though enjoying the game, everything seemed to have too much of a random element. It would really require an expert Quarterback to call the correct plays and give the program a real run for its money.

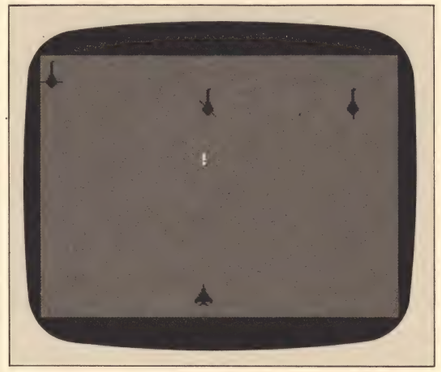
16 WORLD CUP

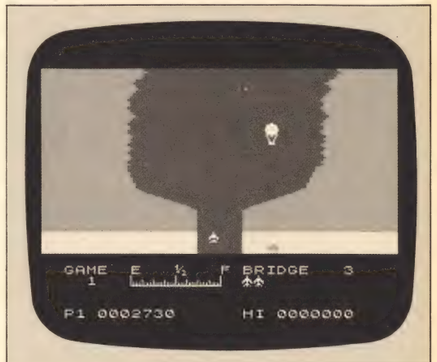
A rise of nine places for this football simulation game from the last *Sinclair Answers* chart. A five-a-side game against the computer's team. Flawed fun for soccer addicts.

Lords of Midnight (priced £9.95) available from:
Beyond,
3rd Floor,
151 Farringdon Road,
london EC13 3AD.
Sabre Wulf (priced £9.95) available from:
Ultimate,
The Green,
Ashby De la Zouch,
Leics. LE6 5JU.
Tel: (0530) 411485.
Match Point (priced £7.95) is available from:
Psion,
22 Dorset Square,
London NW1 6QG.
Jet Set Willy (priced £5.95) is available from:
Software Projects,
Bearbrand Complex,
Allerton Road,
Walton,
Liverpool.
Tel: (051) 428 9393.
Pyjamarama (priced £6.95) is available from:
Microgen,
44 Broadway,
Bracknell,
Berks. RG12 1AG.
Tel: (0344) 427317.
Tornado Low Level (priced £6.95) is available from:
Vortex,
280 Brooklands Road,
Manchester M23 9HD.
Football Manager (priced £6.95) is available from:
Addictive Games,
7a Richmond Hill,
Bournemouth,
Dorset BH2 6HE.
American Football (priced £9.99) is available from:
Argus Press Software,
1 Golden Square,
London W1R 3AB.
Tel: (01) 837 2899.
World Cup (priced £6.95) is available from:
Artic Computing,
Main Street,
Brandesburton,
Driffield YO25 8RL.









Clockwise: freaky fun from 'Frank N Stein'; a location from 'Twin Kingdom Valley'; (almost) empty skies in 'Black Hawk'; approaching the target in 'River Raid'.

Psytron (priced £7.95) is available from:
Beyond,
Competition House,
Farnden Road,
Market Harborough,
Leics LE16 9NR.
Tel: (0858) 34567.
Mugsy (priced £6.95) is available from:
Melbourne House,
Castleyard House,
Castleyard,
Richmond, Surrey.
Tel: (01) 940 6064.
Frank N Stein (priced £5.95) is available from:
PSS,
452 Stoney Stanton
Road,
Coventry CV6 5DG.
Tel: (0203) 667556.
Twin Kingdom Valley (priced £7.95) is available from:
Bug-Byte,
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Liverpool L1 8JB.
Tel: (051) 709 7071.
Fighter Pilot (priced £7.95) is available from:
Digital Integration,
Watchmoor Trade
Centre,
Watchmoor Road,
Camberley,
Surrey GU15 3AJ.
Tel: (0276) 684859.
Black Hawk (priced £6.95) is available from:
Creative Sparks,
Thomson House,
296 Farnborough
Road,
Farnborough,
Hants. GU14 7NU.
Tel: (0252) 543333.
River Raid (priced £7.99) is available from:
Activision,
15 Harley House,
Marylebone Road,
London NW1.
Tel: (01) 486 7588.

17 PSYTRON

Despite winning high praise from us (see *Sinclair Answers* No 1), *Psytron* has plunged 10 places down the Hit List. A multi-screen, multi-level game with good graphics, *Psytron* is like a mega-complicated version of *Space Invaders*.

18 MUGSY

Again a rave review from *Sinclair Answers* has failed to boost this game (is our influence flagging?). *Mugsy* was Number three in our last Hit List. A gangster game with the appearance of a comic strip, it deserves to fare better chartwise.

19 FRANK N STEIN

You play the mad professor whose job it is to collect all the right parts for his monster. There are various aliens to be avoided and springs to allow the professor to jump levels. Once the pieces have been collected in the right order, the Prof activates his creation and moves onto the next level. There are 50 different levels if you ever manage to become that proficient.

Too little attention seems to have been paid to details though. There are no skill levels, nor a Hall of Fame. Frankly, we find going back to square one each time the Prof has lost all his lives excessively tedious. Good in its own genre.

20 TWIN KINGDOM VALLEY

An adventure game rather than arcade style action, Twin Kingdom Valley requires the player to battle with a variety of weird and wonderful monsters. Success is measured by the amount of treasure you can capture and stash back at the local 'Sword Inn'. Although there is a large number of frames to see, sadly the characters mentioned in the text don't actually appear on the screen.

21 FIGHTER PILOT

Slipping down the chart from a previous position of Number 15 in the last *Sinclair Answers* Hit List is Digital's *Fighter Pilot*. More like a training course, but at least you can pick air-to-air combat if you get bored with trying to take-off.

22 BLACK HAWK

If ever a game should earn a black mark for departing from the norm it should be *Black Hawk*. At a guess this game is very loosely based on the Falklands war, with the player piloting the world's deadliest plane against an island enemy.

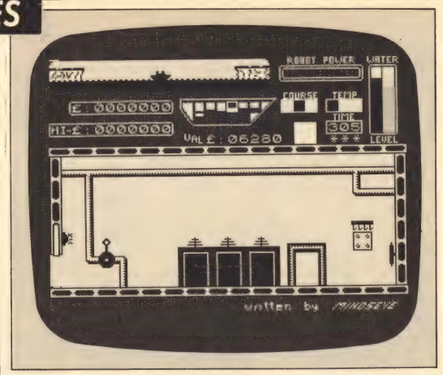
In an effort to gain extra interest by making the game complicated, the authors have committed two deadly sins: one is to give the micro command over whether you are in attack or defence mode, and the other is to provide a bomb site which is neither continuous nor dependent on whether you have any ammunition left. Frustration is more the name of the game than fascination. Strictly for shoot-'em-up masochists.

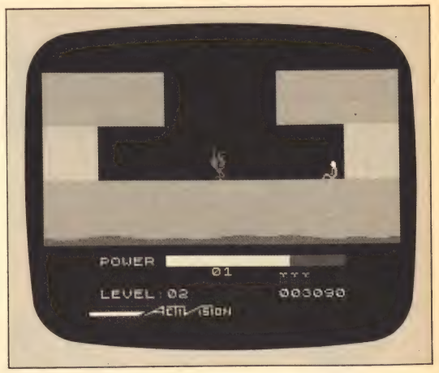
23 RIVER RAID

No shoot-'em-up games fan could possibly complain about *River Raid*. The player has to pilot a plane up a river. The idea is to destroy as many bridges as possible. To make things difficult, the plane needs frequent refuelling. The targets take the form of tanks, frigates, balloons and other aircraft.

As you fly up river the task becomes increasingly difficult. Once the knack has been acquired it is simply a case of using more forward thrust to increase the plane's speed and hence the game's difficulty. Get bored with that and you can choose to up the skill level or start the game at a more difficult bridge. *River Raid* can also be played by two competitors. Unoriginal, but a hit for itchy trigger fingers. ▶

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Right: below decks from 'Worse Things Happen At Sea'; far right: sinister doings to be faced by 'Hero'; below; arid fun from 'Stagecoach'.



24 WORSE THINGS HAPPEN AT SEA

This game gave us considerable enjoyment because it was rather different. The scenario has a cargo ship which begins to take on water. The player has to operate a robot seaman (C-Droid) who rushes about plugging holes and pumping out the holds. The skill is in rushing to the threatened holds before they become too flooded, and ensuring that the C-Droid gets recharged before its power runs out.

Your efforts are rewarded when the ship makes it to dock, unloads its cargo and doesn't lose all the value in repairs. Luckily you have three droids on each voyage. The only gripe we had was that we couldn't find the right settings for our Protek joystick — only AGF and Sinclair joysticks are catered for.

25 HERO

Hero is rather badly named, because this is really a *Jetpac* game in disguise. Roderick Hero has a propellor-powered flying pack on his back which enables him to rescue miners trapped under the earth in a labyrinth of passages. His rescue tools include a number of sticks of dynamite, a microlaser beam and a raft to carry him across the lava flow.

Naturally there are a number of vile beasties lurking in the depths just waiting for a quick blast from Mr Hero's laser. Each time a miner is rescued the game becomes more difficult and the beasties get harder to zap.

26 WHITE LIGHTNING

A high-level graphics development package, whose appearance in the charts indicate that many people are as interested in creating their own games as playing commercial ones. *White Lightning* enables sprite-generated designs, contains 80 commands, interupt-driven routines, and up to 255 sprites can be defined. Programs can be written in either 'Lightning integer Forth' or Basic/Lightning hydrids, depending on how advanced a user you are.

White Lightning is a complex package which enables you to create sophisticated graphics and ideas, and is one of the best games designer for the 48K Spectrum around. Thorough documentation is supplied.

27 STAGECOACH

A silly little escapade in which you have to guide a horsebacked gunhand in his efforts to protect the stagecoach passengers from marauding Indians and themselves (they have a tendency to fall out of the carriage).

Although the idea is reasonable enough, we found the graphics rather primitive (if colourful) and the demands of the game, especially the opening sequence where you have to position the cowboy at a specific place behind the coach to catch the falling passengers, for instance, tiresome and unrewarding.

Stagecoach has several scenario options and levels of play, however, the incessant collisions with cacti and routine spills left us feeling rather saddle-sore.

28 MICRO OLYMPICS

Micro Olympics is yet another fossil from last summer, which boasts 11 challenging track and field events; the only challenge as far as we could see was in sustaining interest through to the final event.

After choosing your event you select two keys to control, say, your stick-athelete's legs in the running events, or throwing in the shot putt and javelin, for example. In the latter, after the projectile has been cast, a rather poor picture of the field is shown with the trajectory of the object mapped across the screen by a line of ascending dots.

29 KENTILLA

A D&D adventure in classic style, set in a faraway land where all manner of dirty work is afoot. Complicated but enjoyable, *Kentilla* should prove enjoyable to adventure game freaks, but tiresomely familiar to adventure diletantes: lots of silly-named characters doing silly things in silly-named places. Graphics are quite good, but nowhere up to the standard of, say, *Mugsy* or *The Hulk*.

30 THE QUILL

Not a game, but an adventure-creation package that helps you write your own. It consists of three databases, each used to design a specific facet of the game, and aims to get the novice user into action with no previous programming knowledge.

Worse Things Happen At Sea (priced £5.95) is available from:
Silversoft,
271-273 King Street,
London W6 9LZ.
Tel: (01) 748 4125.
Hero (priced £7.99) is available from:
Activision,
15 Harley House,
Marylebone Road,
London NW1.
Tel: (01) 486 7588.
White Lightning (priced £14.95) is available from:
Oasis Software,
Tel: (0934) 419921.
Stagecoach (priced £6.95) is available from:
Creative Sparks,
Thomson House,
296 Farnborough Road,
Farnborough,
Hants. GU14 7NU.
Tel: (0252) 543333.
The Quill (priced £14.95) is available from:
Gilsoft,
30 Hawthorn Road,
Barry,
Sth Glamorgan,
Tel: (0446) 73639.

INTO BATTLE

WE PRESENT 'ASSAULT', OUR LISTING FOR WARGAMERS WHO LIKE TO MIX THINKING WITH FIGHTING.

March, 1945: a British General struggles across the fields with the battle-scarred remnants of his penetration force. His mission: to seize control of enemy HQ. Accompanied by two tank, three light artillery, and four infantry divisions, he leads into the forest wherein lies his goal. Standing in his way are the equally battered enemy defenders, and a river which may only be crossed by one of two bridges . . .

This is the scenario for our *Assault* wargame listing. The aim is to get your General across the river and through the door of the enemy HQ; or alternatively, the game may be won by complete destruction of the opposing forces.

The game is lost if at any time the General is killed or if he has failed to cross the river before the enemy has blown both the bridges. *Assault* has an unlimited number of repeating turns until a conclusion is reached, each turn consisting of several phases: player move, player fire, resolution, enemy move, enemy fire, resolution. Let's go through these in turn.

Player move: The player is given the option to move all, some or none of his units. This is done by selecting a string of numbers between 1 and 4, and entering them for each piece. The piece will then execute the moves in order up to a maximum of its movement point allowance, ignoring any impossible moves, before the prompt passes to the next piece. The flashing compass which appears on the screen will indicate which numbers correspond to which directions. Each type of unit has a different movement maximum and certain terrain features have higher movement costs to enter:

Unit:	Movement Pts:
Infantry	5
Light Artillery	4
Tanks	3
General	3
Terrain:	**Movement Cost:**
Fields	1
Forest	2
Bridge	2
River	No Go
Other piece	No Go

If a unit is not desired to move no direction numbers should be entered.

Player fire: Any or all of the player's pieces may fire. The target position should be traced out and entered just as in the movement phase. If the fire lands in an empty terrain space it will be immediately resolved; in this way trees may be removed and converted to fields in order to speed up movement. If the target is a unit, the resolution comes afterwards so that several pieces may fire at the same enemy. Each piece has an attack strength and a defence strength as a measure of their combat abilities. If a units defence is ever less than starting strength it is wounded and if it drops to 0 the unit is eliminated. Wounded player pieces turn cyan, enemies turn black.

Bridges may take a certain amount of damage before they are destroyed and they will go from blue to red to magenta to green in the process, to indicate their state of repair. Each unit has a maximum firing range which is calculated usying a pythagorean formula in order to allow direct straight firing lines. The details of each unit are:

Unit:	Attack:	Defence:	Range:
Infantry	1	2	1.5
General	0	2	1.5
Light Artillery	2	3	5.1
Tanks	4	4	3.1
Anti-Tank Post	5	3	6.1

Unit in forest squares have an additional defencive advantage for cover. The General may attack even though his attack is 0, he is just not very good at it.

Enemy Move/Enemy Fire: The enemy performs the same manoeuvre as the player and conforms to the same rules. Anti-tank posts do not move.

There are five levels of difficulty to *Assault*, and different tactics may be required for each. Be very careful of your General: he is a weak piece and if ever any enemy gets within range he will be fired upon. Here's a summary of Unit Types:

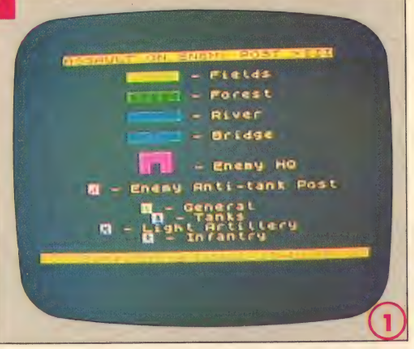
Unit:	Movement:	Attack:	Defence:	Range max:
Infantry	5	1	2	1.5
General	3	0	2	1.5
Light Artillery	4	2	3	5.1
Tanks	3	4	4	3.1
Enemy Anti-Tank Post	0	5	3	6.1

The *Assault* listing given includes checksum numbers (for example, <123>). Do not type these in, they are just a check to see if you have typed the lines in correctly (see *Sinclair Answers* No. 1).

The listing begins on page 35; on the following two pages there is a blow-by-blow visual description of a full-bloodied encounter, showing how a battle should progress. ▶

By Tony Cotterill, a freelance programmer.

'ASSAULT' BATTLE—



1



2

(1) The title screen shows the symbols for each unit, and the countryside. The enemy forces are in red, and the allies are in blue. The following screens show a battle, *Sinclair Answers* editor taking on level 1.

(2) The initial dispositions of the forces. Moves are made alternately, starting with the human player.

(3) Both sides have moved towards the bridges. Red showing an obvious sense of importance about the one closest to their HQ.

(4) Battle has commenced. A Red tank unit suffers some casualities guarding the main bridge (it changes colour to show this). Blue has dispatched a few infantry units to attack the second bridge, to try to divert some of the enemy units away from the main attack.

(5) Blue's diversionary move has worked. A number of Red units have moved to cover the second bridge, where another fight has started.

(6) Heavy casualties on both sides has left Blue in control of the second bridge. The fight around the main bridge is restricted to tank and artillery fire. (Note the Blue general hiding in the forest to keep out the way!)

(7) Red's artillery clears the second bridge, so further infantry units are sent to recapture it. A fierce fight has developed on the other bridge, as one of Blue's artillery units moves into close battle with a similar unit of Reds Army.

(8) The fight round the main bridge has drawn most of the main tank and artillery units into it. Blue recaptures the second bridge, though Red is showing little importance in it now.



5



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BLOW-BY-BLOW



3



4



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16

(9) The battle is swinging in Blue's favour. A number of Red units have been eliminated in the fight for the main bridge, but one Red artillery unit remains dug in as it defends a solid position by the river.

(10) One of Blue's artillery units has successfully silenced the anti-tank guns protecting the HQ. However, the advance is still restricted by the Red artillery.

(11) Blue launches all its remaining tanks into Red's artillery, who are still doggedly defending their position. Any advance of Blue's general over the main bridge is rendered impossible by this unit.

(12) The tank attack is not completely successful. Reds artillery suffers casualties (it has now changed colour), but still remains in action. Blue changes plan. It has destroyed the second anti-tank unit, and one unit of tanks is sent against Red's remaining infantry. This is to enable Blue's general to pass over the second bridge to try to capture the HQ.

(13) Red's artillery unit remains put.

(14) Red's infantry have had enough and make a run for it, pursued by Blue's artillery. The remainder of Blue's force continues the attack against Red's artillery.

(15) Blue now senses complete victory. The last remnants of Reds infantry are wiped out in a short battle in the forest. The defending artillery unit finally gives in, having put up the greatest defence of any unit in the battle.

(16) Blues general can now come out of the forest. His army is finally victorious.

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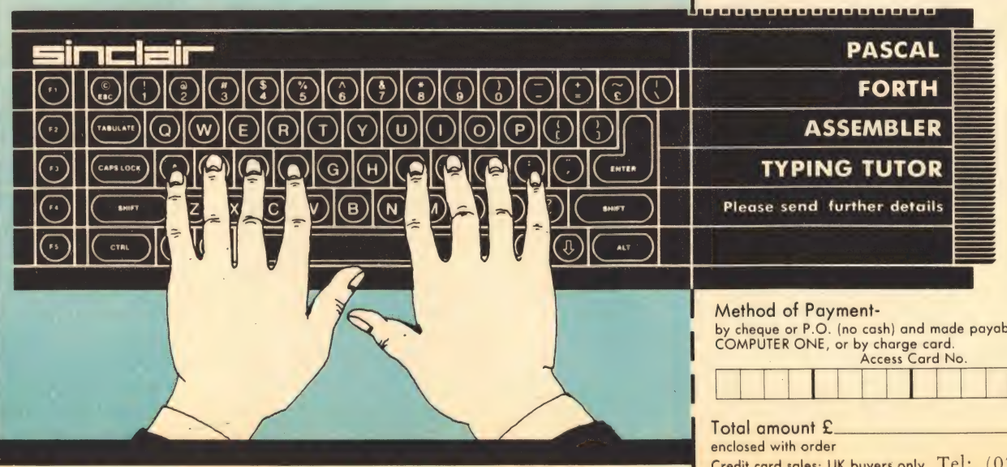
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FIG.1 ASSAULT

```
  2 REM Set up UDGs <151>
  3 GO SUB 9900 <107>
  6 REM Title page <131>
  7 GO SUB 9500 <208>
 10 REM Introduction <222>
 11 GO SUB 9400 <120>
 15 REM Set up map <194>
 16 GO SUB 9000 <240>
 50 REM Player movement <209>
 51 GO SUB 1000 <059>
 60 REM Player fire <192>
 61 GO SUB 1500 <002>
 70 REM Enemy move <219>
 71 GO SUB 3000 <021>
 80 REM Enemy fire <196>
 81 GO SUB 6000 <210>
899 GO TO 50 <082>
900 INK 7: PAPER 0: STOP  <127>
901 REM ****************** <088>
1000 PAUSE 20: PRINT AT 20,0; PAPER 1:"
                                        ";AT 21
,13; INK 7; PAPER 2;"MOVEMENT": BEEP .1,20: PAUSE 100 <
009>
1010 INK 0: PAPER 7: FLASH 1: PRINT AT 17,30;"1";AT 18,
29;"4+2";AT 19,30;"3": FLASH 0 <243>
1020 PRINT AT 21,0: INK 7; PAPER 2;"ENTER MOVES FOR FLA
SHING UNIT...": BEEP .1,20 <158>
1030 FOR a=1 TO 10 <091>
1035 IF W(a,5)=0 THEN  GO TO 1170 <068>
1040 PRINT AT W(a,1)-1,W(a,2)-1; INK W(a,7); PAPER W(a,
8); FLASH 1;CHR$ W(a,6) <050>
1050 INPUT m$ <176>
1060 IF m$="" THEN  GO TO 1160 <019>
1070 FOR b=1 TO LEN m$: IF CODE m$(b)<49 OR CODE m$(b)>
52 THEN  GO TO 1050 <158>
1080 NEXT b <163>
1090 LET move=W(a,5) <160>
1095 FOR b=1 TO LEN m$ <255>
1100 LET newy=W(a,1)+(1 AND m$(b)="3")+(-1 AND m$(b)="1
") <186>
1105 LET newx=W(a,2)+(1 AND m$(b)="2")+(-1 AND m$(b)="4
") <162>
1110 IF newy<1 OR newy>20 OR newx<1 OR newx>32 THEN  NE
XT b <055>
1115 LET move=move-1 <158>
1120 IF C(newy,newx)=145 OR C(newy,newx)=146 THEN  LET
move=move-1 <000>
1125 IF move<0 THEN  GO TO 1160 <060>
1130>IF C(newy,newx)=32OR ATTR (newy-1,newx-1)>55THEN G
O TO 1150 <190>
1135 PRINT AT W(a,1)-1,W(a,2)-1; INK I(W(a,1),W(a,2));
PAPER P(W(a,1),W(a,2));CHR$ C(W(a,1),W(a,2)) <024>
1140 LET W(a,1)=newy: LET W(a,2)=newx <096>
1145 PRINT AT W(a,1)-1,W(a,2)-1; INK W(a,7); PAPER W(a,
8); FLASH 1;CHR$ W(a,6): BEEP .01,move*3+20 <235>
1150 NEXT b <229>
1160 PAUSE 50: PRINT AT W(a,1)-1,W(a,2)-1; INK w(a,7);
PAPER W(a,8);CHR$ W(a,6) <154>
1165 IF W(1,1)=4 AND W(1,2)=28 THEN  GO TO 7000 <183>
1170 NEXT a <010>
1180 RETURN  <105>
1181 REM ****************** <071>
1500 DIM f(ennos) <081>
1510 PAUSE 100: PRINT AT 21,0; PAPER 1;"
                    ": INK 7: PAPER 2: PRINT AT 21,7;"PLAY
ER FIRE PHASE": BEEP .1,20: PAUSE 30: PAUSE 50: PRINT A
T 21,0;"DO YOU WISH TO FIRE AT ALL?  Y/N": BEEP .1,20 <
073>
1520 IF INKEY$="N" OR INKEY$="n" THEN  RETURN  <221>
1525 IF INKEY$="Y" OR INKEY$="y" THEN  GO TO 1535 <042>
1530 GO TO 1520 <239>
1535 PRINT AT 21,0;"GUIDE ATTACK OF FLASHING PIECE..":
BEEP .1,20 <242>
1540 FOR a=1 TO 10 <091>
1545 IF W(a,4)=0 THEN  GO TO 1650 <163>
1550 PRINT AT W(a,1)-1,W(a,2)-1; INK W(a,7); PAPER W(a,
8); FLASH 1;CHR$ W(a,6) <046>
1560 INPUT m$: BEEP .2,0 <177>
1562 FOR b=1 TO LEN m$: IF CODE m$(b)<49 OR CODE m$(b)>
52 THEN  GO TO 1560 <174>
1563 NEXT b <130>
1565 IF m$="" THEN  GO TO 1640 <207>
1567 LET ydir=0: LET xdir=0 <051>
1570 FOR b=1 TO LEN m$ <152>
1575 LET ydir=ydir+(1 AND m$(b)="3")+(-1 AND m$(b)="1")
 <251>
1577 LET xdir=xdir+(1 AND m$(b)="2")+(-1 AND m$(b)="4")
 <241>
1578 NEXT b <179>
1580 LET range=SQR ((xdir*xdir)+(ydir*ydir)) <039>
1585 IF range>W(a,9) OR range=0 THEN  GO TO 1640 <119>
1590 LET yt=W(a,1)+ydir: LET xt=W(a,2)+xdir: IF yt<1 OR
 yt>20 OR xt<1 OR xt>32 THEN  GO TO 1640 <022>
1595 IF ATTR (yt-1,xt-1)>55 AND ATTR (yt-1,xt-1)<62 THE
N  GO TO 1625 <036>
1600 FOR n=1 TO 10: LET p=USR 65200: NEXT n <179>
1610 IF C(yt,xt)=145 AND (INT (RND*3)+W(a,3))>4 THEN  L
ET C(yt,xt)=144: LET I(yt,xt)=6: FOR g=1 TO 5: PRINT AT
 yt-1,xt-1: INK 2; PAPER 4;" ": PAUSE 10: PRINT AT yt-
1,xt-1: INK 6;" ": PAUSE 10: NEXT g: PRINT AT yt-1,xt-
1; INK I(yt,xt); PAPER P(yt,xt);CHR$ C(yt,xt) <011>
1615 IF C(yt,xt)=146 AND yt=8 THEN  LET B(1)=B(1)-(W(a,
3)+INT (RND*6)) <246>
1617 IF C(yt,xt)=146 AND yt=9 THEN  LET B(2)=B(2)-(W(a,
3)+INT (RND*6)) <232>
1620 GO SUB 1900 <211>
1622 GO TO 1640 <206>
1625 FOR s=1 TO ennos: IF W(s,1)=yt AND W(s,2)=xt THEN
 LET f(a)=s: GO TO 1640 <250>
1630 NEXT s <214>
1640 PRINT AT W(a,1)-1,W(a,2)-1; INK W(a,7); PAPER W(a,
8);CHR$ W(a,6) <159>
1650 NEXT a <232>
1651 REM ****************** <171>
1700 REM Resolution <122>
1710 FOR D=1 TO ennos: LET att=0 <011>
1715 FOR A=1 TO ennos <181>
1720 IF f(A)=D THEN  LET att=att+W(A,3) <033>
1725 NEXT A <007>
1730 IF att=0 THEN  GO TO 1775 <140>
1732 IF D<11 THEN  PRINT AT 21,0; INK W(D,7); PAPER 7;"
       ";CHR$ W(D,6); INK 2;" Under Attack          ";
 BEEP .01,20: PAUSE 20 <169>
1735 FOR n=1 TO (5*att): LET j=USR 65200: NEXT n <084>
1740 IF D<11 THEN  LET aSTR=att+INT (RND*6): LET dSTR=W
(D,4)+INT (RND*dice) <160>
1743 IF D>10 THEN  LET dSTR=att+INT (RND*6): LET aSTR=W
(D,3)+INT (RND*dice) <161>
1744 IF C(W(D,1),W(D,2))=145 THEN  LET dSTR=dSTR+2 <244
>
1745 IF dSTR>=aSTR THEN  GO TO 1770 <062>
1750 LET W(D,4)=W(D,4)-(aSTR-dSTR): IF W(D,4)>0 THEN  G
O TO 1760 <083>
1752 FOR g=1 TO 5: PRINT AT W(D,1)-1,W(D,2)-1; INK 2; P
APER 4;" ": BEEP .1,-25: PAUSE 2: PRINT AT W(D,1)-1,W(
D,2)-1; INK 6; PAPER 4;" ": BEEP .1,-30: PAUSE 2: NEXT
 g <215>
1755 LET y=W(D,1): LET x=W(D,2): PRINT AT y-1,x-1; INK
I(y,x); PAPER P(y,x);CHR$ C(y,x) <103>
1757 FOR g=1 TO 9: LET W(D,g)=0: NEXT g <178>
1758 GO TO 1775 <214>
1760 IF W(D,7)=2 OR W(D,7)=3 THEN  LET W(D,7)=0 <172>
1765 IF W(D,7)=1 OR W(D,7)=4 THEN  LET W(D,7)=5 <169>
1770 PRINT AT W(D,1)-1,W(D,2)-1; INK W(D,7); PAPER W(D,
8);CHR$ W(D,6) <056>
1775 IF W(1,4)=0 THEN  GO TO 8000 <049>
1780 NEXT D <075>
1785 LET enemy=0 <117>
1790 FOR a=11 TO 21: IF W(a,4)>=1 THEN  LET enemy=enemy
+1 <210>
1795 NEXT a <152>
1800 IF enemy>0 THEN  RETURN  <166>
1805 GO TO 7100 <072>
1890 REM ****************** <150>
1900 REM Bridge(s) destroyed? <166>
1905 IF B(1)<1 AND C(8,4)=146 THEN  PAPER 5: FOR g=1 TO
 10: PRINT AT 7,3; INK 2;" ": BEEP .1,-20: PRINT AT 7,
3; INK 6;" ": BEEP .1,-25: NEXT g: PRINT AT 7,3;" ": L
ET C(8,4)=32: LET I(8,4)=5: LET P(8,4)=5 <232>
1910 IF B(2)<1 AND C(9,16)=146 THEN  PAPER 5: FOR g=1 T
O 10: PRINT AT 8,15; INK 2;" ": BEEP .1,-20: PRINT AT
8,15; INK 6;" ": BEEP .1,-25: NEXT g: PRINT AT 8,15;"
": LET C(9,16)=32: LET I(9,16)=5: LET P(9,16)=5 <223>
1915 FOR c=1 TO 2 <027>
1920 IF B(c)<1 THEN  LET B(c)=0 <087>
1925 LET y=7+c: LET x=-8+(12*c) <149>
1930 LET I(y,x)=INT (5-(B(c)/5)) <147>
1931 IF ATTR (y-1,x-1)<62 AND ATTR (y-1,x-1)>55 THEN  G
O TO 1940 <073>
1935 PRINT AT y-1,x-1; INK I(y,x); PAPER 5;CHR$ C(y,x)
<016>
1940 NEXT c <013>
1950 IF B(1)=0 AND B(2)=0 AND (W(1,1)>12 OR (W(1,1)>8 A
ND W(1,2)<19)) THEN  GO TO 8100 <016>
1990 RETURN  <048>
1993 REM ****************** <016>
3000 LET cb2=0: LET cb1=0: LET adv=0 <027>
3002 PAUSE 2: PRINT AT 21,0; PAPER 1;"
                    ";AT 21,9; PAPER 2; INK 7;"ENEMY MOVEMEN
T": BEEP .1,20: PAUSE 50 <127>
3003 INK 6: PAPER 4: PRINT AT 17,30;" ";AT 18,29;"
 ";AT 19,30;" " <059>
3005 FOR a=1 TO 10 <239>
3010 IF W(a,1)=0 THEN  GO TO 3025 <205>
3015 LET adv=adv+(20-W(a,1)) <022>
3017 LET cb1=cb1+(32-ABS (W(a,2)-4)) <141>
3020 LET cb2=cb2+(32-ABS (W(a,2)-16)) <174>
3025 NEXT a <070>
3030 FOR a=13 TO ennos <193>
3035 IF W(a,5)=0 THEN  GO TO 3060 <240>
3040 LET ch=INT (RND*(adv+cb1+cb2)) <115>
3045 IF ch<=adv THEN  GO SUB 4000 <049>
3050 IF ch>adv AND ch<=(adv+cb1) THEN  GO SUB 4500 <190
>
3055 IF ch>(adv+cb1) THEN  GO SUB 5000 <227>
3060 NEXT a <099>
3065 RETURN  <003>
3070 REM ****************** <043>
4000 REM Enemy advances <046>
4005 LET c1=0: LET rn=20 <177>
4010 FOR v=1 TO 10: IF W(v,4)=0 THEN  GO TO 4020 <172>
4015 LET p=SQR ((W(a,1)-W(v,1))*(W(a,1)-W(v,1))+(W(a,2)
-W(v,2))*(W(a,2)-W(v,2))) <246>
4017 IF p<rn THEN  LET rn=p: LET c1=v <239>
4020 NEXT v <048>
4025 LET move=W(a,5) <080>
4030 LET dist=SQR ((W(a,1)-W(c1,1))*(W(a,1)-W(c1,1))+(W
(a,2)-W(c1,2))*(W(a,2)-W(c1,2))) <150>
4035 IF dist<=W(a,9) THEN  RETURN  <243>
4040 IF ABS (W(c1,1)-W(a,1))>=ABS (W(c1,2)-W(a,2)) THEN
  LET y=W(a,1)+SGN ((W(c1,1)-W(a,1))): LET x=W(a,2): GO
 TO 4050 <081>
4045 LET y=W(a,1): LET x=W(a,2)+SGN ((W(c1,2)-W(a,2)))
<096>
4050 IF ATTR (y-1,x-1)=56 OR ATTR (y-1,x-1)=58 OR ATTR
(y-1,x-1)=59 OR C(y,x)=32 THEN  LET h=INT (RND*4): LET
y=W(a,1)+(1 AND h=0)+(-1 AND h=1): LET x=W(a,2)+(1 AND
h=2)+(-1 AND h=3) <138>
4051 IF y<1 THEN  LET y=1 <006>
4052 IF x<1 THEN  LET x=1 <001>
4053 IF y>20 THEN  LET y=20 <012>
4054 IF x>32 THEN  LET x=32 <015>
4055 IF C(y,x)=145 OR C(y,x)=146 THEN  LET move=move-1
<200>
4060 LET move=move-1 <018>
4065 IF move<0 THEN  RETURN  <047>
4070 IF ATTR (y-1,x-1)=56 OR ATTR (y-1,x-1)=58 OR ATTR
(y-1,x-1)=59 OR C(y,x)=32 THEN  GO TO 4030 <203>
4075 PRINT AT W(a,1)-1,W(a,2)-1; INK I(W(a,1),W(a,2));
PAPER P(W(a,1),W(a,2));CHR$ C(W(a,1),W(a,2)) <151>
4080 LET W(a,1)=y: LET W(a,2)=x <233>
4085 PRINT AT W(a,1)-1,W(a,2)-1; INK W(a,7); PAPER W(a,
8);CHR$ W(a,6): BEEP .01,25 <126>
4090 GO TO 4030 <160>
4500 REM Cover bridge no.1 <056>
4501 IF C(8,4)<>146 THEN  GO TO 3040 <148>
4502 LET move=W(a,5) <097>
4505 IF ABS (W(a,2)-4)<3 AND ABS (W(a,1)-8)<3 THEN  RET
URN  <207>
4510 LET x=W(a,2)+SGN (4-W(a,2)): LET y=W(a,1) <033>
4515 IF ATTR (y-1,x-1)<62 AND ATTR (y-1,x-1)>55 OR C(y,
x)=32 THEN  LET h=INT (RND*2): LET x=W(a,2): LET y=W(a,
1)+(1 AND h=1)+(-1 AND h=0) <215>
4516 IF y<1 THEN  LET y=1 <111>
```

FIG. 1 CONT.

```
4517 IF x<1 THEN  LET x=1 <110>
4520 IF C(y,x)=145 OR C(y,x)=146 THEN  LET move=move-1
<169>
4525 LET move=move-1 <125>
4530 IF move<0 THEN  RETURN  <098>
4535 IF (ATTR (y-1,x-1)<62 AND ATTR (y-1,x-1)>55) OR C(
y,x)=32 THEN  GO TO 4510 <216>
4540 PRINT AT W(a,1)-1,W(a,2)-1; INK I(W(a,1),W(a,2));
PAPER P(W(a,1),W(a,2));CHR$ C(W(a,1),W(a,2)) <222>
4545 LET W(a,1)=y: LET W(a,2)=x <198>
4550 PRINT AT W(a,1)-1,W(a,2)-1; INK W(a,7); PAPER W(a,
8);CHR$ W(a,6): BEEP .01,25 <083>
4555 GO TO 4510 <182>
5000 REM Cover bridge no.2 <037>
5001 IF C(9,16)<>146 THEN  GO TO 3040 <172>
5002 LET move=W(a,5) <127>
5005 IF ABS (W(a,2)-16)<3 AND ABS (W(a,1)-9)<3 THEN  RE
TURN  <249>
5010 LET x=W(a,2)+SGN (16-W(a,2)): LET y=W(a,1) <009>
5015 IF ATTR (y-1,x-1)<62 AND ATTR (y-1,x-1)>55 OR C(y,
x)=32 THEN  LET h=INT (RND*2): LET x=W(a,2): LET y=W(a,
1)+(1 AND h=1)+(-1 AND h=0) <225>
5016 IF y<1 THEN  LET y=1 <081>
5017 IF x<1 THEN  LET x=1 <080>
5018 IF x>32 THEN  LET x=32 <095>
5020 IF C(y,x)=145 OR C(y,x)=146 THEN  LET move=move-1
<159>
5025 LET move=move-1 <115>
5030 IF move<0 THEN  RETURN  <116>
5035 IF (ATTR (y-1,x-1)<62 AND ATTR (y-1,x-1)>55) OR C(
y,x)=32 THEN  GO TO 5010 <204>
5040 PRINT AT W(a,1)-1,W(a,2)-1; INK I(W(a,1),W(a,2));
PAPER P(W(a,1),W(a,2));CHR$ C(W(a,1),W(a,2)) <208>
5045 LET W(a,1)=y: LET W(a,2)=x <176>
5050 PRINT AT W(a,1)-1,W(a,2)-1; INK W(a,7); PAPER W(a,
8);CHR$ W(a,6): BEEP .01,25 <045>
5055 GO TO 5010 <202>
5060 REM ****************** <036>
6000 PAUSE 5: PRINT AT 21,8; PAPER 2; INK 7;"ENEMY FIRE
 PHASE": BEEP .1,20: PAUSE 50 <096>
6005 DIM f(ennos) <146>
6010 FOR a=11 TO ennos <117>
6015 IF W(a,4)=0 THEN  GO TO 6050 <004>
6020 FOR d=1 TO 10 <207>
6025 IF W(d,4)=0 THEN  GO TO 6045 <204>
6030 LET y=W(a,1)-W(d,1): LET x=W(a,2)-W(d,2) <149>
6035 LET range=SQR ((x*x)+(y*y)) <189>
6040 IF range<=W(a,9) THEN  LET f(a)=d: GO TO 6050 <198
>
6045 NEXT d <019>
6050 NEXT a <041>
6100 FOR q=13 TO ennos <207>
6110 IF W(q,4)=0 OR f(q)<>0 THEN  GO TO 6155 <062>
6120 LET y=W(q,1)-8: LET x=W(q,2)-4: LET range=SQR ((y*
y)+(x*x)) <151>
6122 IF ATTR (7,3)>44 THEN  GO TO 6140 <120>
6125 IF range<=W(q,9) AND INT (RND*(dice-2))=0 AND C(8,
4)=146 THEN  PRINT AT 21,0; INK 2; PAPER 7;"  Enemy Att
acking West Bridge    ": PAUSE 20: BEEP .01,20: FOR a=1
TO 10: LET p=USR 65200: NEXT a: LET B(1)=B(1)-(W(q,3)+1
NT (RND*3)) <092>
6140 LET y=W(q,1)-9: LET x=W(q,2)-16: LET range=SQR ((y
*y)+(x*x)) <165>
6142 IF ATTR (8,15)>44 THEN  GO TO 6150 <160>
6145 IF range<=W(q,9) AND INT (RND*(dice-4))=0 AND C(9,
16)=146 THEN  PRINT AT 21,0; INK 2; PAPER 7;"  Enemy At
tacking East Bridge    ": PAUSE 20: BEEP .01,20: FOR a=1
 TO 10: LET p=USR 65200: NEXT a: LET B(2)=B(2)-(W(q,3)+
INT (RND*3)) <141>
6150 GO SUB 1900 <159>
6155 NEXT q <159>
6160 GO TO 1700 <079>
7000 REM Victory <228>
7005 PAPER 2: INK 5: FOR a=0 TO 21: PRINT AT a,0;"

  ": PAUSE 2: NEXT a <001>
7010 INK 2: PAPER 7: PRINT AT 4,8;"CONGRATULATIONS!";AT
 7,5;"Your General has taken";AT 8,10;"the enemy HQ";AT
 20,0; INK 6: PAPER 3:;"Press 'Q' to quit, 'R' to repla
y" <018>
7015 LET n$="FCCDFOOKFCCDCFFDDAACDFCCECAFCEAHFFF" <154>
7020 LET i$="1411133614111336141112411113113163 3" <225>
7025 FOR a=1 TO 35 <029>
7030 BEEP .13*VAL i$(a),CODE n$(a)-61 <058>
7035 IF INKEY$="Q" OR INKEY$="q" THEN  NEW  <080>
7040 IF INKEY$="R" OR INKEY$="r" THEN  RUN  <186>
7045 NEXT a <002>
7050 GO TO 7025 <024>
7100 PAPER 6: INK 2: FOR a=0 TO 21: PRINT AT a,0;"

  ": PAUSE 2: NEXT a <224>
7110 INK 1: PAPER 7: PRINT AT 4,8;"CONGRATULATIONS!";AT
 7,5;"You have destroyed all";AT 8,10;"enemy units!";AT
 11,6;"Your General can now";AT 12,7;"take the enemy HQ
!";AT 20,0; INK 6: PAPER 3:;"Press 'Q' to quit, 'R' to
replay" <025>
7120 GO TO 7015 <087>
8000 REM Defeat <130>
8005 PAPER 0: INK 6: FOR a=0 TO 21: PRINT AT a,0;"

  ": PAUSE 2: NEXT a <029>
8010 INK 0: PAPER 6: PRINT AT 4,5;"Your General is dead
!!";AT 7,4;"Your mission has failed!";AT 20,0; INK 6; P
APER 3:;"Press 'Q' to quit, 'R' to replay" <164>
8020 IF INKEY$="Q" OR INKEY$="q" THEN  NEW  <123>
8025 IF INKEY$="R" OR INKEY$="r" THEN  RUN  <103>
8030 GO TO 8020 <227>
8100 PAPER 7: INK 5: FOR a=0 TO 21: PRINT AT a,0;"

  ": PAUSE 2: NEXT a <252>
8110 INK 7: PAPER 1: PRINT AT 4,2:"Both bridges have be
en blown";AT 5,4;"and your General has not";AT 6,7;"cro
ssed the river!";AT 10,4;"Your mission has failed!";AT
 20,0; INK 6; PAPER 3:;"Press 'Q' to quit, 'R' to replay
" <213>
8115 GO TO 8020 <014>
8999 REM ****************** <218>
9000 DIM C(20,32): DIM I(20,32): DIM P(20,32): DIM B(2)
 <079>
9005 LET B(1)=20: LET B(2)=20 <019>
9010 FOR a=1 TO 20: FOR b=1 TO 32: LET C(a,b)=144: LET
I(a,b)=6: LET P(a,b)=4: NEXT b: NEXT a <092>
9015 FOR d=1 TO 4: LET r=25+(d*5): RESTORE 9600+r: READ
 code,ink,pap,sectors <094>
9020 RESTORE 9000+r: FOR a=1 TO sectors: READ w,x,y,z:
FOR a=w TO x: FOR b=y TO z: LET C(a,b)=code: LET I(a,b)
=ink: LET P(a,b)=pap: NEXT b: NEXT a: NEXT s <011>
9025 NEXT d <251>
9030 DATA 1,4,1,5,5,6,1,1,5,5,5,5,1,2,6,8,3,3,8,8,12,13
,6,10,14,20,1,10,17,18,11,16,1,3,23,25,1,6,31,32,6,8,22
,29,1,1,19,30,6,7,30,31,13,13,3,5,15,16,11,11,16,17,17,
18 <146>
9032 DATA 1,1,9,17,2,2,13,13,2,2,16,16,15,16,18,19,16,1
7,20,20,5,6,21,21,2,2,22,22,9,9,23,23,9,9,26,26,19,19,1
1,11,16,16,15,15,15,15,12,12 <054>
9035 DATA 8,8,1,10,7,7,10,13,8,8,13,14,9,9,10,19,10,10,
19,21,11,11,21,22,12,12,22,32,10,11,31,32,13,13,31,32,1
1,11,29,30,9,9,32,32 <052>
9040 DATA 3,3,27,29,4,4,27,27,4,4,29,29 <217>
9045 DATA 8,8,4,4,9,9,16,16 <240>
9100 PAPER 1: BORDER 1: CLS  <112>
9110 FOR a=1 TO 20: FOR b=1 TO 32: PRINT AT a-1,b-1; IN
K I(a,b); PAPER P(a,b);CHR$ C(a,b): NEXT b: NEXT a <043
>
9115 PRINT AT 20,0; PAPER 1;"
                                " <093>
9120 DIM W(ennos,9) <072>
9125 RESTORE 9130: FOR a=1 TO ennos: FOR b=1 TO 2: READ
 W(a,b): NEXT b: NEXT a <059>
9127 IF ennos=25 THEN  LET W(7,1)=16: LET W(7,2)=11 <12
8>
9130 DATA 18,28,15,29,17,19,18,14,19,21,17,26,15,8,15,1
4,17,22,14,23,3,10,4,24,6,15,7,17,5,10,4,13,5,22,5,3,4,
6,6,12,6,18,3,16,7,4,10,12,14,4 <244>
9135 LET a=1: RESTORE 9140: FOR b=3 TO 9: READ W(a,b):
NEXT b <036>
9140 DATA 0,2,3,147,4,7,1,5 <055>
9145 FOR a=11 TO 12: RESTORE 9150: FOR b=3 TO 9: READ W
(a,b): NEXT b: NEXT a <010>
9150 DATA 5,3,0,151,3,7,6,1 <015>
9155 FOR a=2 TO 3: RESTORE 9200: FOR b=3 TO 9: READ W(a
,b): NEXT b: NEXT a <062>
9157 FOR a=4 TO 6: RESTORE 9210: FOR b=3 TO 9: READ W(a
,b): NEXT b: NEXT a <051>
9160 FOR a=7 TO 10: RESTORE 9220: FOR b=3 TO 9: READ W(
a,b): NEXT b: NEXT a <254>
9162 FOR a=13 TO 14: RESTORE 9230: FOR b=3 TO 9: READ W
(a,b): NEXT b: NEXT a <203>
9164 FOR a=15 TO 17: RESTORE 9240: FOR b=3 TO 9: READ W
(a,b): NEXT b: NEXT a <196>
9166 FOR a=18 TO 21: RESTORE 9250: FOR b=3 TO 9: READ W
(a,b): NEXT b: NEXT a <236>
9168 FOR a=22 TO ennos: FOR b=3 TO 9: READ W(a,b): NEXT
 b: NEXT a <054>
9200 DATA 4,4,3,148,1,7,3,1 <030>
9210 DATA 2,3,4,149,1,7,5,1 <035>
9220 DATA 1,2,5,150,1,7,1,5 <131>
9230 DATA 4,4,3,148,2,7,3,1 <231>
9240 DATA 2,3,4,149,2,7,5,1 <198>
9250 DATA 1,2,5,150,2,7,1,5 <165>
9255 DATA 1,2,5,150,2,7,1,5 <160>
9260 DATA 2,3,4,149,2,7,5,1 <242>
9265 DATA 4,5,3,148,2,7,3,1 <216>
9270 DATA 5,3,0,151,3,7,6,1 <128>
9300 FOR a=1 TO ennos: PRINT AT W(a,1)-1,W(a,2)-1; INK
W(a,7); PAPER W(a,8);CHR$ W(a,6): NEXT a <019>
9350 REM ****************** <122>
9400 LET n$="MIDIDBADDIKIMNMMMMKIIIDKDK" <050>
9410 LET t$="1431613111161111311131717" <083>
9420 FOR a=1 TO 26: BEEP (VAL t$(a)*.1),CODE n$(a)-64:
NEXT a <064>
9430 RETURN  <003>
9435 REM ****************** <014>
9500 PAPER 0: BORDER 0: CLS  <230>
9510 PRINT AT 1,3; INK 0; PAPER 6;"ASSAULT ON ENEMY POS
T XIII" <029>
9520 INK 6: PAPER 4: PRINT AT 3,9;"     "; PAPER 0
;" - Fields" <124>
9525 PRINT AT 5,9; INK 0;"     "; INK 6; PAPER 0;"
 - Forest" <115>
9530 PRINT AT 7,9; PAPER 5;"     "; PAPER 0;" - River"
<007>
9535 PRINT AT 9,9; INK 1; PAPER 5;"     "; INK 6; PAPE
R 0;" - Bridge" <168>
9540 INK 3: PRINT AT 11,9; PAPER 0;"     ";AT 12,9;"
     "; INK 6; PAPER 0;" - Enemy HQ" <026>
9545 INK 3: PAPER 7: PRINT AT 14,5;" "; INK 6; PAPER 0
;" - Enemy Anti-tank Post" <173>
9550 INK 4: PAPER 7: PRINT AT 16,10;" "; INK 6; PAPER
0;" - General" <174>
9555 INK 1: PAPER 7: PRINT AT 17,11;" "; INK 6; PAPER
0;" - Tanks" <175>
9560 INK 1: PAPER 7: PRINT AT 18,6;" "; INK 6; PAPER 0
;" - Light Artillery" <248>
9565 INK 1: PAPER 7: PRINT AT 19,10;" "; INK 6; PAPER
0;" - Infantry" <208>
9570 PRINT AT 21,0; INK 0; PAPER 6; FLASH 1;"    Difficu
lty Level (1-5) ?    " <252>
9571 LET x$=INKEY$ <123>
9572 IF CODE x$<54 AND CODE x$>48 THEN  GO TO 9575 <059
>
9573 GO TO 9571 <239>
9575 LET x=VAL x$ <016>
9580 LET dice=9-x <248>
9585 LET ennos=20+x <181>
9590 PRINT AT 21,0; INK 1; PAPER 5;"           Please wa
it!           " <089>
9595 PAUSE 30: PAUSE 20 <118>
9625 RETURN  <077>
9630 DATA 145,0,4,28 <237>
9635 DATA 32,5,5,11 <074>
9640 DATA 32,3,3,3 <123>
9645 DATA 146,1,5,2 <255>
9650 REM ****************** <100>
9900 RESTORE 9930: FOR a=USR "a" TO USR "i"+7: READ u:
POKE a,u: NEXT a <001>
9930 DATA 170,85,170,85,170,85,170,85,0,8,28,28,42,28,4
2,8,255,126,60,60,60,60,126,255 <209>
9935 DATA 0,60,66,90,90,66,60,0,0,8,28,124,28,62,85,62,
1,2,52,124,56,84,238,68,0,24,24,126,24,24,36,66,2,7,14,
28,60,116,228,228,136,80,37,30,56,87,148,2 <087>
9940 RESTORE 9950: FOR a=65200 TO 65219: READ u: POKE a
,u: NEXT a <019>
9950 DATA 6,0,197,96,17,1,0,46,3,205,181,3,193,4,120,21
4,16,32,239,201 <041>
9970 RETURN  <037>
```


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ADVENTS IN ADVENTURES

A BRIEF LOOK AT SOME OF THE NEW AND INTRUIGING ADVENTURE GAMES ON THE SPECTRUM MARKET.

You are in a software shop. You are surrounded by shelves of games. The choice is bewildering. Fed-up with mindless alien zapping, you want something that will stretch your imagination a bit further. What do you do now . . . ?

Adventure games are awkward things to choose: unlike arcade types, it's difficult to judge if you'll like what you're about to buy from seeing it up and running for a few minutes in the shop. One that seems dull at first may eventually engross you so deeply that friends, family and work are neglected as you spend days at your Spectrum lost in some quest; on the other hand, one with excellent graphics could end up boring you to tears after a few minutes play.

As a suppliment to our games chart and reviews of *Hampstead*, *Deus Ex Machina* and *Aural Quest*, we've taken a look at some of the other Spectrum adventure games on the market, we reckon worth considering, and which may at least give you an idea of what you're *not* looking for.

FOREST

The evil wizard, Zarn, has captured the Princess Mara and imprisoned her deep in the The Forest. Her father, the King, has turned to you for help. Your job, naturally, is to rescue the Princess and return her safely to The Great Valley. You begin your quest in The Great Valley itself, weaponless, penniless and foodless: set out to find the former, which was very easy. There are graphics for some locations, and these are drawn instantly; the text responses are immediate as well.

There are creatures around to avoid — we took no hesitation in beating them to a pulp, although be careful with the wording of your commands or you'll be killed instead!

No real surprises in this game and we found it very pernickety with it's commands. Although the graphics were good, we're afraid the game couldn't match them.

MESSAGE FROM ANDROMEDA

The second offering from David Banner of Interceptor has you cast as a captain of the Space Patrol cruiser, Galaxy. While on patrol you receive a distress signal coming from an unknown planet, and have to find the source of this.

You find yourself in our ship armed with a laser-pistol, and see a message flashing across your computer screen. Once you've performed the obvious thing, it should be plain sailing to land.

The *Forest*, graphics and text appear instantaneous. There are numerous objects lying around, but being able to carry only five it's difficult to know what to grab especially as the author has thrown in a couple of objects which are of no use at all — although you don't know this till the end of the game.

Although Andromeda is not particularly difficult we still found it enjoyable, although it does have undertones of Artic's *Space Adventures*.



THE FINAL MISSION

'Exhausted, you made your way through the Mountains of Ket and finally located and entered the Temple of Vran. Once inside you cunningly brought about Delphais demise. Using her magic sceptre you found the secret entrance and a flight of stairs leading to the lower Temple. As you descended the stairs you were enshrouded in gloom and the air thickened. You recall a blow to the head. Hours later you awaken . . . Stunned . . .'

This is where the cassette inlay finishes and *Mission* starts, after an extremely rapid load (using a PowerLoader). This text-only adventure is very difficult, and isn't really recommended to beginners. The test response is slow and coupled with the slow input routine makes the entering of commands tedious.

Although being a text only adventure, *Mission* still holds a very well laid-out screen with the description of the location in a box at the top, which doesn't disappear off the top! There are nice twirls and an on-screen scoring system.

All-in-all, a very good and pleasing adventure, but to get the most enjoyment it is best to play it as part of the whole Trilogy, as, when you beat one, you have the option of loading the next one directly.

RETURN TO EDEN

The follow up to Level 9's extremely successful *Snowball*, and the second in The Silicon Dream Trilogy, *Return to Eden* is a departure from the normal format for Level 9 as it includes graphics. This, of course, meant that Level 9 had to cut down on their excellent text descriptions, but we don't believe that this fact detracts anything from the game.

For those of you who completed *Snowball*, the scenario for this game may come as a bit of a surprise. Rather than being commended for your work in saving Snowball 9 from certain death, you are framed as trying to destroy the Ship! When you are taken away to be forced to suffer from 'vacuum-exposure' you capture a Stratoglider (Snowball's lifeboat), and zoom off to Eden in hope of a nice, easy life. No chance! For a start the Glider landed nowhere near civilisation and secondly, the crew of Snowball have a score to settle. So, firstly you must escape from the Snowball's next method of attempted murder, and then get away from it's after effects.

EUREKA!

By the time you read this many of you will be feverishly working away, trying to be the person who will win Domark's prize of £25,000 — we promise you a hard task! This adventure will have you muttering strange things when you go shopping, and you'll break out into a sweat each time someone mentions Archimedes famous word, it's that involved. Composed of 250K of arcade adventure games, each section is loaded in succession.

The plot is this: this Talisman is an alien artifact found on the Moon by the Apollo 17 mission, but nobody can trace it's origin. The talisman, a cube of crystal 15 inches square resisted all attempts at analysis until it was subjected to the intense beams of the SHIVA Fusion Project Laser. The Talisman shattered into eight pieces under the beams and each of it's corners vanished.

You, of course, have been chosen to seek out the last five of these corners, in five different time zones: Prehistoric Europe; Roman Italy; Celtic Britain; Wartime Germany; and Modern Caribbean.

The graphics and music are good and the response to inputs is refreshingly quick although the graphics are drawn fairly slowly. An excellent adventure, and highly recommended.

By Peter Marment and Gary Smart, freelance writers.



Forest At Worlds End and Message from Andromeda (both priced £4) available from:
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THE HARD MEN



Right: Strangler Dave Greenfield gets aural with Sinclair Answers' roving staff writer Steve Applebaum; far right: Greenfield in reflective mood: 'Hopefully [Aura l Quest] will get our music to the Spectrum user.'

WE LENT AN EAR TO THE 'AURAL QUEST' STORY, AN ADVENTURE GAME BASED AROUND ROCK BAND THE STRANGLERS.

Computer games included with Rock albums have become very voguey of late, and The Stanglers, the band known as the 'bad of boys Rock' (due to their exploits on and off stage during the late 70s), are the latest band to explore the idea.

They are giving away a free Spectrum adventure on the cassette version of their latest album. Unlike some other, similar efforts, The Stranglers' *Aural Quest* is a full 48K adventure that compares well with many professional programs on the Spectrum market.

Aural Quest is the brain-child of Dave Greenfield, The Stranglers' keyboard maestor. A keen computer user and adventurer fanatic, Dave was an obvious person to create a game written around the band. Unlike some musicians, Greenfield's interest in computers does not stem from the music, but rather runs parallel to it: 'I was interested in computers before I got so technical on the keyboards side. A friend of mine, Mike Turner, of Star Dreams (who produced the game), got me interested, so I bought an Atari 800, from which I started learning some of the basics,' he says.

Dave has since moved onto the Spectrum. This may be a step backwards as far as keyboard quality is concerned, but it certainly increases the amount of software available. It was, in fact, the number of adventures that helped him to make up his mind.

Greenfield did a lot of the ground work for *Aural Quest*, though he does not think that the original idea of putting the game on the album was his own: 'Somebody in the band suggested a computer game, or something, and I thought 'right, adventure', automatically. I started working out some rough ideas. We then went down and spent some time in Seaford,' (where Star Dreams is based) 'finalised the idea with Mike Turner and his gang, and they added a few embellishments of their own.'

Aural Quest was finally written by the Star Dreams team. Because of the restrictions put on a band when they are recording an album (studio time, for example), Mike Turner decided to use *The Quill* adventure-designer package to cut down programming time. With the Spectrum being such a popular machine, and adventures written using *The Quill* selling well at the moment, *Aural Quest* could probably stand up by itself. Greenfield, however, is modest about its chances: 'You need something special to do well — which this certainly isn't. It's an average *Quill* adventure which relates to the band. Obviously if people know the history of the band it would help, though it is not essential'.

Aural Quest's plot is closely related to both the band and their songs. As Bill, the Stranglers' tour manager, you must fly to Nice, New York, Sweden, Tokyo and Brisbane, and pick up promoters payments for gigs done in each city. As well as the money, the player must pick up four pieces of a large cement ear, which, when assembled, completes the game. On the way to finding the ear, the unsuspecting player could find himself being mugged, ending up in jail, or just being fired. Although there is enough action (and humour) to keep any adventurer happy, there is no variation between the first and second times it is played; each of the pieces of ear crop up in the same locations.

Nice, the first location in the game, comes from one of the Stranglers' most publicised adventures — their arrest following a riot. Over this, the Spectrum beeps our the first few bars of *Down In The Sewer*, a track from The Stranglers' first album, one of seven musical snippits in *Aural Quest*. Dave Greenfield programmed all of them, a process which he says is very easy with *The Quill*.

Brisbane is another location. One of the incidents which prompted the inclusion of Australia in *Aural Quest*, is the band's plane being sprayed with DDT on landing at Brisbane Airport. Greenfield is not sure why it happened, and whether, or not, it actually did; he was asleep at the time, and later told the tale by JJ Burnel, The Stranglers' bassist. Whatever happened, the incident adds a neat future to the game. Other

Other stories surround the band's Australian visit, one even claiming JJ to have been smuggled out in a amplifier case. This is not touched upon in the game, Greenfield pointing out that the escapade is not 100 per cent true; however, it does show how myths created by the media could be used for adventure material.

Now that the game is complete, how does Greenfield see it? Is there a danger that computer games cold be used, like videos, to prop up a musically weak product, and collar new buyers from a different market?

Greenfield is aware of the problem: 'As the game is only on the cassette version, I don't think that would be a fair comment, but hopefully it will expand the market, get our music to a wider audience — the Spectrum user, for example. Obviously that's CBS's idea, a marketing thing. But as the buyer is getting an adventure for nothing, it's not ripping anybody off.'

Aural Quest is one of the better Rock album-based computer games around, and although we wouldn't recommend adventurers to buy the record just for the game. It might prove a good incentive for Stranglers' fans to buy a Spectrum to help pass those empty hours down in the sewer.

By Steve Applebaum, staff-writer.



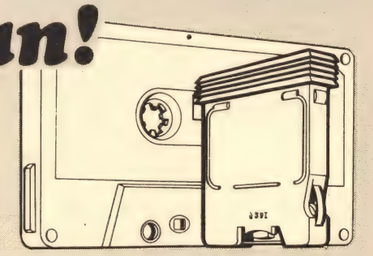
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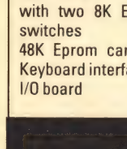
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PUTTING ON THE STYLE

'HAMPSTEAD' IS AN ADVENTURE THAT TAKES SOCIAL CLIMBING, RATHER THAN DRAGON SLAYING, AS ITS INSPIRATION.



ILLUSTRATION: KIERAN PHELPS

These days the would-be self-betterer has only one recourse to up their standing — status. Status is a matter of lifestyle and image, rather than wealth or background; not only being in the right place at the right time, but knowing what to wear when you're there; and it is this that *Hampstead*, a new adventure game from the worthy stable of Melbourne House, takes as its inspiration.

Unlike most adventurers, which base themselves on existing legends and stories, *Hampstead* claims to be about 'real life', the object of the game being social climbing. You, the player, have to progress from being an unemployed layabout living in a seedy bedsit somewhere in North-West London, to becoming the archaetypal 'Hampstead Man'. It is not simply a matter of travelling to Hampstead; it has to be *attained* by gathering the correct items and contacts, found at all the right places.

For readers unfamiliar with the mystique of this particular part of North-East London, Hampstead is famed for retaining its village-like identity within a cosmopolitan context, and is the fave habitat for what are more commonly known as 'Sunday Magazine' lifestylers — TV celebrities, unstruggling actors, literateurs, designers, architects and other middle-of-the-road trendies. It holds the distinction of being the place where Marx lived many years of his life (and indeed most of his death), and can boast a host of other well-known residents, past and present. In short, a highly desirable area. It is to this scene that, in *Hampstead*, you have to aspire to.

Apart from the loading picture of a pair of Afghan hounds reclining on a Habitatty sofa, *Hampstead* is a text-only adventure. You begin in your run-down flat, watching *3-2-1* on TV. Picking your way through the discarded remains of last night's takeway you gather your UB40, don your tracksuit (forget to, and you are arrested for indecent exposure as soon as you go outside), collect your bike, and set off for the dole office. Once you've got your Giro cheque, you must take it to a high street post office and cash it. Now, brass in pocket, you're ready to set out on your quest for the status-ridden heights of the Heathland.

As you head east, you encounter everyday problems of urban life, such as the marauding traffic wardens; linger too long in the bleak main street ▶



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and you risk getting mugged; stray into the sprawling industrial estate and you're lost forever, and have to quit and start again. However, with luck, you come across a charity shop, where one of the requisties of Hampsteadana can be obtained: a trendy second-hand tweed suit. Just along the road is a newsagents, where you can buy another flat — a copy of an antiques magazine.

Next, you can head for the station where you can catch a train into London. If you're lucky, an all ready established Hampstead Man will get on, recognise familiar props, and start a conversation with you. This could lead to an invitation to a Hampstead party, an offer of a job, leading to more favourable encounters, positions, people; or you could pass up this opportunity in anticipation of better offers to come, and head for the delights of the West End — however, beware of the cinema, where you can end up stumbling round in the dark *ad infinitum*, and have to quit again.

The love interest is provided in the character of Pippa, the pouting, 'yar'ring model who you have to woo and win. As you visit more trendy places, make more desirable acquaintances, and collect more acceptable items, you ascend more rungs on the social ladder.

Hampstead works in the usual adventure way, and should be enjoyed by adventure freaks. As with *Valhalla's* Norse Legends, the intellectual fairy tales of *The Hobbit*, and the detective fictions of *Sherlock*, *Hampstead* also draws its scenario ethos from a fictional base — a kind of smug, sit-com mythology, where being on the dole is quaint fun, absolutely smothered in street credibility, and its privations amusing — a world where the reality has been blurred round the edges to suit the 'jokes'.

The claims *Hampstead* can make to being 'realistic' are slim: we suspect that few Hampsteaders worked their passage by squandering unemployment benefit on antiques magazines; they may have set out to attain Hampstead all right, but started from a significantly better position that the 'hero' of the game. The sad thing is that *Hampstead* could have been a lot funnier if the authors had put more effort into basing their creation on genuine observation, rather than filling the gaps in their knowledge with tacky humour.

However, one redeeming feature of the package is the accompanying booklet. Along with the usual loading instructions and vocabulary of useful words, it also contains some hilariously Pythonesque snapshots proportedly taken in and around Hampstead itself; there are also lists of 'Things To Do In Hampstead', and 'Main Causes Of Death In Hampstead' (such as choking on muesli, being savaged by Afghans (dogs, not freedom fighters) and aerobics), and a superb little explanation of why so many architects live in Hampstead ('a place for thinkers and iconoclasts who need the reassurance of stable, quaint surroundings in order to advance theories about knocking them down').

Hampstead does demonstrate that adventures needn't necessarily be restricted to dungeons and dragons, legends and lost treasure. The average inner-city high street is as fraught with perils as any ancient Icelandic waste; it shows that computer games of this type do not have to borrow from other creative sources for ideas, and that the adventure game format can be exploited as a fun medium in its own right, and not just as a teched-up 'Cluedo'.

Hampstead is an interesting addition to any Spectrum games library, and will go down a hoot at your next dinner party.

By Jim Hayes, production editor.

Hampstead (priced £9.95) is available from:
Melbourne House,
Castle Yard House,
Castle Yard,
Richmond TW10 6TF.

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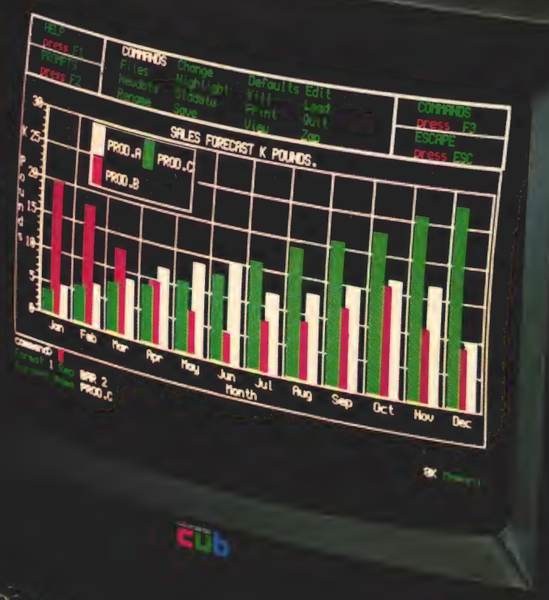
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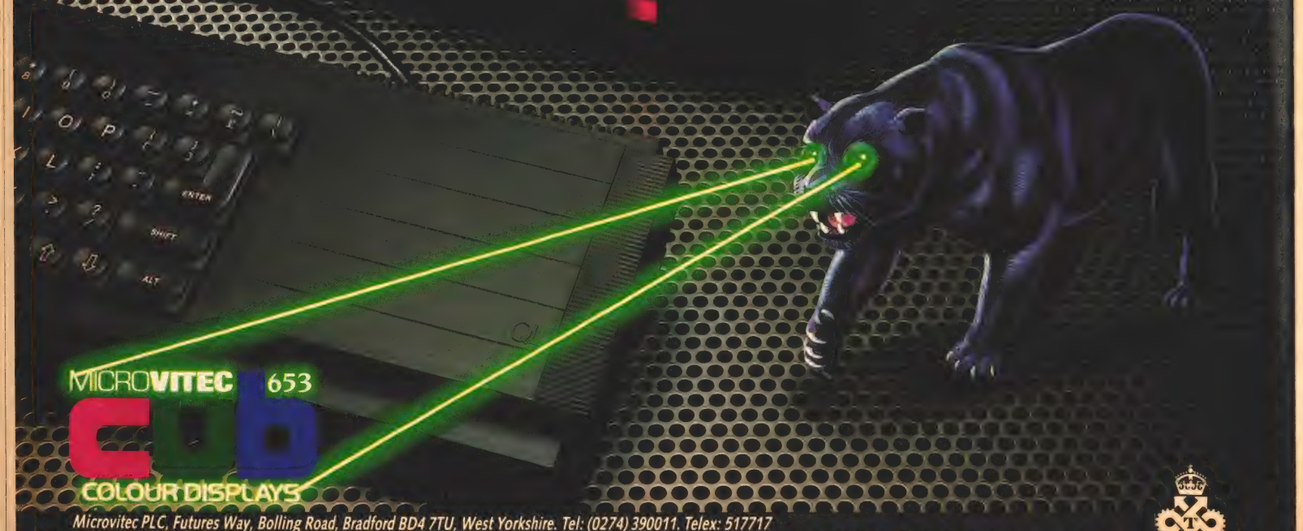
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METAPHYSICAL ADVENTURE

'DEUS EX MACHINA' IS A GAME WHICH EXPLORES THE MYSTERIES OF EXISTENCE, COMPLETE WITH SOUNDTRACK.

Deus Ex Machina is one of the weirdest Spectrum games you're ever likely to come across. As well as being madcap programmers, it seems that the game's writers fancy themselves as musicians, because instead of using the Spectrum's beep, all *Deus Ex Machina*'s sound is supplied on a separate cassette as a full musical score.

There are even vocals by such people as John 'Worzel Gummidge' Pertwee, Ian 'Rhythm Stick' Dury, and Frankie 'no, don't titter' Howard. However, the beep would be preferable in some instances.

Deus Ex Machina's plot, about a computer that turned, is not very original, but the way in which it is carried-off is. The clue to the story is in the title. As anyone fluent in Latin will know, 'deus ex machina' can mean one of two things: either an event that happens at the right moment to solve a difficulty, or, a god introduced into a play to resolve a plot.

It is not easy to say what *Deus Ex Machina* is actually about, as the plot is pretty obscure, but it seemed to us to be a kind of hi-tech parable. Over the past few years, people have become worried that the government will use a computer to store all their details on. This would enable the 'powers that be' to keep a watchful eye on them.

Deus Ex Machina goes a step further, to a stage where even life can be created by machine; and this is where you come in, by helping the machine to form the only free thinking, free loving human on Earth.

Each phase of the development is made up of one of 12 games, a point emphasised by John Pertwee narrating a bastardised version of Shakespeare's 'all the world's a stage' speech. The graphics that accompany the games are on the whole patchy, but at best excellent. Long before the first game starts, the player is treated to some amusing animated characatures of the chief player's.

The first three games are rather disappointing after the opening sequence, however, these merely act as an appetizer: life in the machine begins as several spinning double helixes representing strands of DNA. All the player has to do is move a cursor across the helixes to keep them moving. At the same time another cursor, the scanner of the Defect Police (controllers of the machine), moves across the screen trying to stop you. The next stage, the Cell Producer, is very much the same, except instead of double helixes, small eggs must be kept spinning. Finally, we visit the Belle Bank and more spinning objects. All this is pretty dull, but there are the redeeming dulcet tones of Donna Bailey, the voice of the machine, to listen to while playing them.

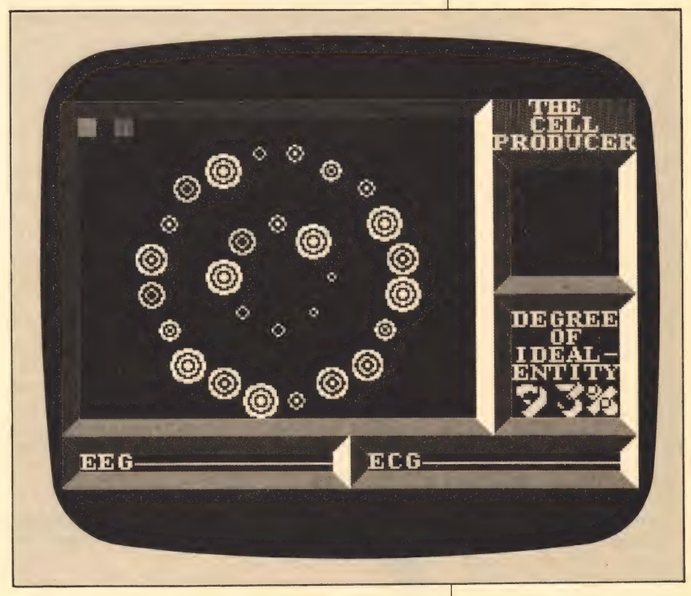
At a point where you might be beginning to feel cheated, Automata throws in a neat little game, and some amusing vocals from Ian Dury. In the Beau Bank, you must nudge a tiny sperm to an awaiting egg. Other sperm, and the Defect Police, make this difficult by blocking your routes. Although it sounds tacky it works well on screen. Once the sperm has reached the egg, the developing form is shown as a embryo surrounded by pulsating cells. By the end of the first nine games, the baby has gone through adolescence and grown into a young man, his thoughts forming at an even faster rate.

Side two of the game cassette (and likewise the audio cassette) contains the concluding stages of life. Although well intended, the game gets so pretentious that it tends to crawl up its own edge connector at this point. The soldier, the first game on side two, is very good graphically, but embarrassing in its naivety. As a young man you try to find your own way in life. But because you are still at an impressionable age, the Defect Police are able to manipulate your actions — when they say jump, you jump. Life may be hard, but not all people are as sheepish as Automata would have us believe. To emphasis their point even further, Frankie Howard is used to talk-sing a pleasant(?) ditty about war crimes: '*War crimes are easy. The uniform's free. Follow the drumbeat. Don't follow me*'.

The Justice, the penultimate game, shows you as a lumbering, pot-bellied middle-aged man. Here you stomp along a road, crushing words such as 'hate' and 'evil', while being careful to jump 'peace' and 'love'. If you get the wrong ones, a city, shown in black in the background, slowly deteriorates. This screen finishes with a length of barbed wire, representing 'your own regime', falling across the screen.

With the best will in the world, Automata has tried to produce a game with a message and a difference. It is very different, and a great idea too, but it has all been wasted on a rather slim, and very hackneyed plot. Recommended only as a curiosity.

By Steve Applebaum, staff-writer.



Deus Ex Machina (priced £15) is available from:
Automata,
27 Highland Rd,
Portsmouth,
Hampshire PO4 9DA.
Tel: (0705) 735242.

PLOTTING YOUR GRAPHICS

MAKE YOUR DATA EASIER TO UNDERSTAND WITH OUR GRAPHICS UTILITY LISTING.

Pictures are undoubtedly more fun than numbers; at least, it's certainly less effort to look at a graph to see what is going on, than to digest a long sequence of figures.

Our utility program here called *Graphplot*, will plot a graph on the screen, or to a printer, from numbers stored in DATA statements on the Spectrum. It can also cope with simple functions, for example y=sin x.

The program, listed in *Fig. 1*, assumes that you are using a Sinclair printer. If you are using a different printer you will probably have to change line 990 of the programs to suit it.

The scale of the Y-axis is calculated automatically, and the increments can vary from thousanths of a unit to millions of them. The only constraint on the Y-axis is that it contains a zero. The X-axis can be of any length, and is only limited by the number of DATA statements that can be held in memory at any one time.

To use *Graphplot*, first type in the listing given. Save it before running it, just to be safe. To run the program type RUN 1000. Note that the numbers in angled brackets after the lines of code are the checksum numbers. Don't type these in, they are just a checking system to see all is OK (for the Checksum program, see *Sinclair Answers* issue No 1).

The DATA statements start at line 1030, the number of them is held in a variable, called PLOTNUMBER, that is set in line number 1008. The listing includes a short demo of 28 numbers. Run the program with these first, just to check that everything is working. Check the output with that in *Fig. 2*; or if you type RUN 2000, should get the output given in *Fig. 3*.

There are a number of questions that you will be asked when the program is running: for example, the graph can be printed on a 'blank' background or with squares to look like graph paper. This is all you need to do to plot a graph from DATA statements. To generate a graph from a function, alter line 2024 to the function required. For example, in the listing it has: LET Y=SIN X. This can easily be changed, for example: LET Y=2 * X, or LET Y=X (K−CX), where K and C are constants that you will need to set up with values.

There are a few parameters that need to be set up to get this function going. XSTART is the first value to be given to the function, it will usually be zero. PLOTNUMBER holds the total number of points that will be plotted. 45 points can be plotted on the Spectrum's screen, without any scrolling. XSCALE holds the number of units that one square on the graph represents.

Finally, if you wish to plot a graph from data generated by another program then follow this procedure:

- ○ Add the line DIM B(n) to your program (not Graphplot!), where n is the number of points to be plotted.
- ○ Alter your program so that all the numbers are stored sequentially in this array, starting from B(1).
- ○ Run your program.
- ○ Type SAVE "name" DATA B(), to save the array to tape with the name "name". You could verify the correct saving with, VERIFY "NAME" DATA B().
- ○ Load Graphplot.
- ○ Load the array by typing LOAD "name" DATA B ().
- ○ Do not now type RUN, instead type GOTO 8, and the graph will be plotted.

All in all, a simple way of getting an interesting picture from a boring set of numbers!

By Stephen Fowler, a computer programmer.

FIG.1

```
  1 REM GRAPHPLOT <166>
  2 PRINT "Type RUN 1000 or RUN 2000" <225>
  3 STOP  <238>
  8 LET PLOTNUMBER=1000000 <044>
  9 LET XSCALE=2.5: REM plots per square <171>
 14 LET PR=0: LET SQ=0 <033>
 15 INPUT "Squared Paper(y/n)";c$ <131>
 16 IF c$="y" THEN  LET SQ=1 <203>
 17 INPUT "Output to printer(y/n)";c$ <232>
 18 IF c$="y" THEN  LET PR=1 <201>
 19 INPUT "Type graph title then ENTER ";C$ <196>
 20 INPUT "How many points to be plotted:";LENGTH <217
>
 21 GO SUB 995 <037>
 88 LET C=0: LET MAX=0: LET MIN=0 <223>
 89 CLS : PRINT "WAIT" <097>
 90 FOR I=1 TO LENGTH <052>
 92 IF B(I)>MAX THEN  LET MAX=B(I) <134>
 93 IF B(I)<MIN THEN  LET MIN=B(I) <133>
 94 NEXT I: GO SUB 992 <239>
 95 LET RATIO=1 <238>
 96 LET RATIO=RATIO/10 <157>
 98 IF (RATIO)>((MAX-MIN)/1000) THEN  GO TO 96 <127>
102 GO SUB 800 <152>
104 LET INC=0 <222>
106 IF MIN=0 THEN  GO TO 124 <174>
107 LET INC=10*RATIO*(INT ((0-MIN)/(10*RATIO))+1) <093
>
108 LET MAX=MAX+INC <207>
110 GO SUB 800 <144>
112 LET MAX=MAX-INC <213>
114 LET INC=10*RATIO*(INT ((0-MIN)/(10*RATIO))+1) <068
>
116 LET MAX=MAX+INC <215>
117 LET PLOT=0 <131>
120 IF MAX<>0 THEN  LET PLOT=INT (MAX/RATIO+.5) <069>
121 IF PLOT>255 THEN  GO TO 110 <024>
124 CLS : LET YS=4: REM GOTO HERE <168>
125 LET XNEW=INT ((B(1)+INC)/RATIO+.5) <150>
126 PLOT XNEW,175 <047>
127 LET XPOS=(PEEK 23677) <024>
128 GO SUB 365 <057>
129 FOR I=2 TO LENGTH <239>
130 LET XOLD=XNEW <083>
131 LET XNEW=INT ((B(I)+INC)/RATIO+.5) <021>
134 DRAW XNEW-XOLD,(-4+(PEEK 23678=175)) <127>
135 IF PEEK 23678=0 OR I=LENGTH THEN  GO TO 139 <199>
138 GO TO 155 <196>
139 GO SUB 350: REM GOTO HERE <227>
155 NEXT I <047>
158 CLS  <106>
160 FOR Y=0 TO 255 STEP 10 <197>
161 FOR X=175 TO 165 STEP -1 <027>
163 PLOT Y,X <112>
165 NEXT X: NEXT Y <149>
166 FOR Y=0 TO 255 STEP 20 <222>
167 FOR X=165 TO (155-10*(Y/40=INT (Y/40))) STEP -1 <2
01>
168 PLOT Y,X <123>
169 NEXT X: NEXT Y <153>
170 FOR I=0 TO 32 STEP 5 <010>
172 PRINT AT 4,I;CHR$ (65+I/2.5) <251>
173 IF I<30 THEN  PRINT AT 3,I+2;CHR$ (65+I/2.5+1) <20
1>
174 NEXT I <026>
179 PRINT '"Y AXIS:" <032>
180 FOR I=0 TO 12 <193>
182 PRINT ;" ";CHR$ (65+I);" IS ";(I*20*RATIO)-INC <21
1>
184 NEXT I <012>
186 GO SUB 985: CLS  <118>
187 PRINT "X-AXIS"'"One square is ";XSCALE;" units" <0
19>
190 PRINT AT 3,0;LENGTH;" plots"'C$ <235>
192 GO SUB 985: CLS  <012>
199 STOP  <042>
356 LET XPOS=(PEEK 23677) <002>
360 GO SUB 985 <098>
365 CLS : REM GOTO HERE <110>
370 IF I=LENGTH THEN  RETURN  <213>
380 IF NOT SQ THEN  GO TO 504 <186>
400 LET YS=YS+1 <074>
410 FOR X=0 TO 255 STEP 5 <199>
414 FOR Y=YS TO 175 STEP 10 <152>
416 PLOT X,Y <114>
417 NEXT Y: NEXT X <144>
418 LET YS=YS-5 <126>
419 IF YS<0 THEN  LET YS=YS+10 <104>
420 FOR X=0 TO 255 STEP 10 <193>
422 FOR Y=YS TO 175 STEP 10 <160>
424 PLOT X,Y <122>
426 NEXT Y: NEXT X <155>
504 PLOT XPOS,175 <184>
506 RETURN  <010>
800 REM  GO SUB  <042>
804 LET PLOT=0 <209>
805 IF MAX<>0 THEN  LET PLOT=INT (MAX/RATIO+.5) <027>
806 IF PLOT<256 THEN  RETURN  <240>
808 LET C=C+1 <242>
809 IF C=4 THEN  LET C=1 <241>
830 GO SUB 900+C <008>
840 GO TO 808 <180>
901 LET RATIO=RATIO*2: RETURN  <128>
902 LET RATIO=RATIO*2.5: RETURN  <054>
903 LET RATIO=RATIO*2: RETURN  <130>
984 RETURN  <042>
985 IF PR THEN  GO TO 990 <228>
987 INPUT "PRESS ENTER";A$ <088>
988 RETURN  <046>
990 COPY  <045>
991 RETURN  <045>
992 IF NOT (MIN=0 AND MAX=0) THEN  RETURN  <037>
993 PRINT "THE GRAPH IS JUST ALL ZEROS" <034>
994 STOP  <012>
995 IF LENGTH<=PLOTNUMBER THEN  RETURN  <232>
996 PRINT AT 10,0;"TOO MANY. MAXIMUM IS ";PLOTNUMBER <
167>
997 BEEP 3,-10: CLS : GO TO 20 <022>
999 REM ---------- <027>
1000 PRINT "GRAPH PLOTTED USING DATA 1N""LINES 1030 TO
 1036""WAIT" <216>
1008 LET PLOTNUMBER=28 <059>
1010 DIM B(PLOTNUMBER) <093>
1011 RESTORE 1030 <026>
1012 FOR I=1 TO PLOTNUMBER <133>
1014 READ X: LET B(I)=X <236>
1016 NEXT I <079>
1017 LET XSCALE=2.5: REM plots persquare <127>
1018 GO TO 10 <023>
1030 DATA 100,90,40,39,38,30,30 <142>
1032 DATA 29,25,29,32,36,38,3 <215>
1034 DATA 14,28,40,38,37,36,35 <144>
1036 DATA 34,35,35,27,25,30,32 <182>
1999 REM ---------- <055>
2000>PRINT "GRAPH OF Y AS A FUNCTION OF X""WAIT" <023>
2012 GO SUB 2019 <215>
2013 DIM B(PLOTNUMBER) <118>
2015 GO TO 2041 <194>
2018 REM ********** <012>
2019 LET XSTART=0 <019>
2020 LET XSCALE=.5 <217>
2022 LET PLOTNUMBER=80 <103>
2023 RETURN  <017>
2024 LET Y=SIN X <155>
2026 RETURN  <028>
2040 REM ********** <022>
2041 LET COUNT=1 <077>
2042 LET X=XSTART <118>
2044 GO SUB 2024 <242>
2045 LET B(COUNT)=Y <110>
2060 LET COUNT=COUNT+1 <197>
2064 IF COUNT>PLOTNUMBER THEN  GO TO 10 <168>
2065 LET X=X+XSCALE/2.5 <079>
2080 GO TO 2044 <050>
```

FIG.2

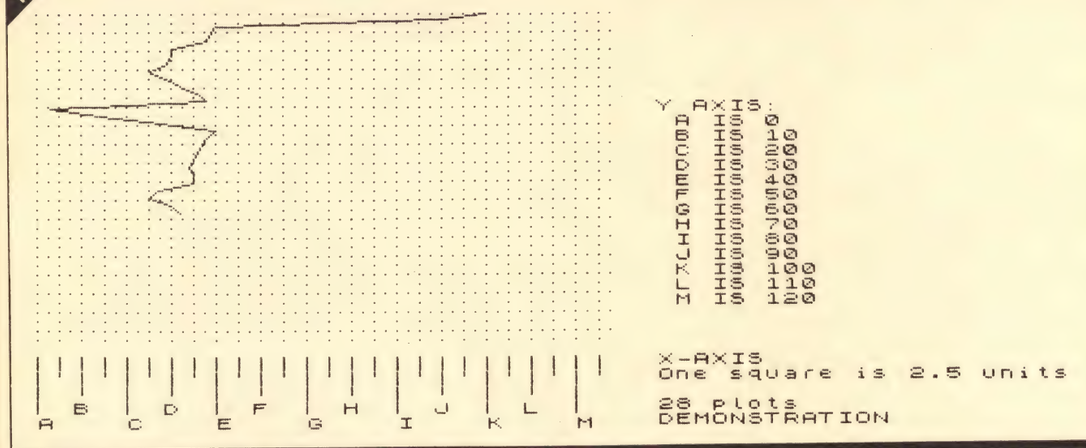


FIG.3

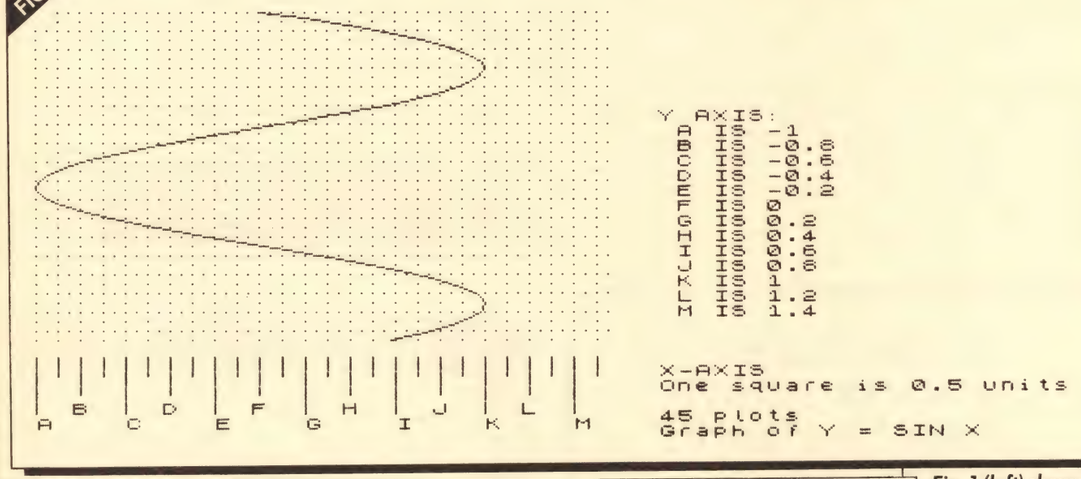


Fig. 1 (left) shows the graphics utility listing; Fig.'s 2 and 3 show the two possible outputs (see text).

UTILITIES FOR THE QL

Morse Tutor £8.50 as for the 48K Spectrum but no speech

FIVE programs on one Microdrive for the Sinclair QL. "Nothing very dramatic . . . could be quite useful" (PCW).

1 "boot"

displays DIRectory in columns, and allows LOADing of programs with single key-press. Without this, the directory will overflow the screen if you have more than about 18 files on cartridge; also "load mdv1_ program" has 17 keypresses!

2 "qmark"

will allow you to FORMAT a cartridge repeatedly (as recommended by SINCLAIR). You only have to enter a name and number one.

3 "qback"

makes back-up copies of cartridges. One key-press will copy *all* files onto an *empty* cartridge, or you may single-step and choose whether or not to copy each file. If receiving cartridge is *not* empty, you will be asked whether or not to over-write any namesake of a file about to be copied. You can copy from many cartridges onto one until it is *full*.

4 "qprune"

well delete any file with a single key-press, so *be careful* with this one!

5 "qprint"

outputs files to printer.

Instructions

on paper and in a QUILL file (for when you lose the paper!). *All four programs* will work with the extra micro-drives if you get them, and have been successful with cartridges holding over 60 files each.

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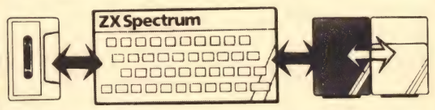
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PLUSES AND MINUSES APART, DOES C LANGUAGE ON THE SPECTRUM MAKE THE GRADE?

C LANGUAGE

C, the language in which systems are written in the business world, is now available to the Spectrum user in a package from Hisoft. C is the standard language on UNIX systems and their derivatives (indeed the operating system UNIX itself is about 90 per cent written in C), and is interesting for any Spectrum owner who wants to extend their programming beyond Basic.

However, Hisoft's version it is not unfortunately a full implementation of C. There are some standard features missing. The most important of these, and the most irritating, is the omission of floating point operations. This means that only integer arithmetic is possible.

Unless the user is very experienced already with C then he will need to buy the reference text book on the topic, *The C Programming Lanuage* (by Brian W Kernighan and Dennis M Ritchie). This provides the definition of the lanugage and also a tutorial introduction to C; it is also fairly expensive at £17.95. The Hisoft manual is written on the understanding that the user has a copy of this book.

Loading the compiler was a straightforward process, however, despite suggestions to the contrary in the user manual, we could find no provision to make a back-up copy of the program to cassette — an essential procedure. The program does a copy to Microdrive if required. To be fair, the manual is dated August 1984, and often talks about future versions of the compiler.

Unusual for a language such as C is the ability to compile either from a file or alternatively by entering the source code directly into the compiler. It should be emphasised that the code is compiled and not interpreted, like Basic. The consequences of this can be seen in the benchmarks. The executable code produced by the compiler is very fast indeed.

We wrote the standard C program with which all C users (especially Kernighan and Ritchie readers) will be familiar. This program is as follows:

```
main ()
{
print ("hello world");
}
```

This program was executed without any problems (a major achievement!). We then went on to use the editor. This is a text editor with a fairly simple set of commands. We found it easy to use, and are sure the user would have no problem here. There are facilities provided for putting source onto tape (or Microdrive), and getting it back again. this was found to work without any difficulty. However, we were unable to make the Include <filename> command work properly — the system crashed every time as the compiler seemed unable to find the correct filename on the tape.

We did manage to use the editor to read the data in from the tape, and subsequently use the Include command in the compiler.

Compilation itself is very fast taking place at a rate which approaches the rate at which the Spectrum can write to the screen. In C it is easy to write programs which contain very obscure bugs, because the language is designed for system design, and so does not contain many of the precautions (overflows and bound checks, for example) carried out by other languages. This has the effect of speeding up the execution time considerably, but making it possible to produce very bizzare effects while the program is in the development stage. Hisoft C is particularly helpful in this respect since the compiler gives clearly understandable error messages which certain commercial systems would do well to emulate! The one runtime error which might usefully be included is overflow. The arithmetic is all performed by use of a 16-bit integer so it is fairly easy to get an overflow.

This particular error did lead to rather strange results in the benchmarks initially before we traced it down to a loop counter which was over-flowing silently. The manual does suggest that a future version (and all first buyers get updates free of charge) will use 32 bit integers. This enhancement would we feel be a very worthwhile addition.

We carried out three benchmark tests and compared these with standard Spectrum Basic. The difference in speed between the two languages was so great that in order to get reasonable estimates for C we had to wait rather a long time for Basic. The benchmarks were as follows: BM1 (a simple loop of 10000 times carrying out a simple calculation based on the loop counter); BM2 (as BM1 except with an additional outer loop of 10 times); BM3 (as BM2 including an IF statement used to print out the loop counter every 5000 execution).

The results were as follows:

BM	Basic:	C:
1	44s	4s
2	7m 17s	39s
3	16m 42s	1m 43s

As can readily be seen from the results, C is much much faster than Basic, and also a much more sophisticated language being truly block structured. It is also possible in this version of the compiler to use inline machine code, although the user would need to have an intimate knowledge of the hexadecimal values of the required operations.

The package comes with an extension library closely based on the standard UNIX/C library. This library resides on the second side of the tape supplied. It consists of two files, namely the header file stdio.h which contains all the necessary declarations, and the stdio.lib file, which contains the source code for each routine. A very good feature here is the inclusion in the code of only the routines actually called by the user's function which is obviously of particular importance on a machine with limited memory.

We tested out a variety of the library functions, which include a sort utility as standard. Oddly, the Include command worked well on these files despite, our inability to include our own files as discussed earlier. No problems were found with the library functions, the only criticism being one of frustration caused by the slow transfer rate of the tape drive, slowing the compilation down considerably.

Fortunately, most of the standard functions (like printf) are included in the runtime system, and are not required to be loaded from the library on tape.

Hisoft's package seems to be a fine version of the C language. It is not a full implementation of C, but nevertheless would give a very good introduction to anyone wishing to learn any of the basics of it's programming skills. The inclusion of structures and unions as standard is particularly important.

By Andrew Tindell, a computer consultant.

Hisoft C (priced £25) available from:
Hisoft,
180 High Street North,
Dunstable,
Beds LU6 1AT.
Tel: (0582) 696421.







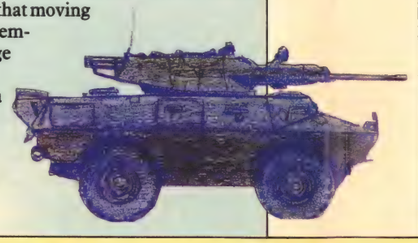
The winner of our competition will win a Rotronics Wafadrive (far left), and a Cheetah 68FX1 add-on keyboard (above); for QL owner winners there's a selection of QL software from Computer One (see left).

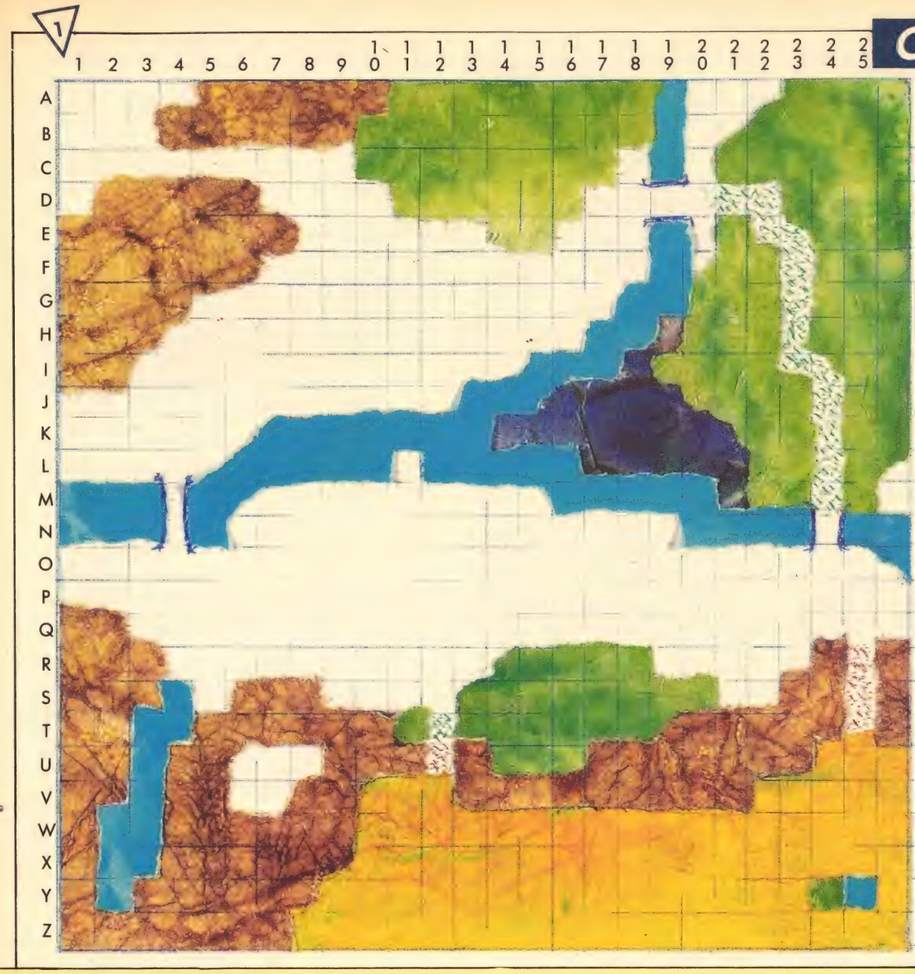
'We shall fight on the seas and oceans, we shall fight on the beaches, we shall fight on the landing grounds, we shall fight in the fields and in the streets, we shall fight in the hills; we shall never surrender.'

These famous words by Sir Winston Churchill, suggest that the great man was unaware that moving about on all this differing terrain can be quite a problem at times. Any strategist will find themselves very conscious of landscape features when playing wargames, and you'll have to judge the best routes for an army to take.

This gave us the inspiration for a great competition, in which Spectrum owners can win a professional-looking Cheetah 68FX1 add-on keyboard and brand new Wafadrive system; QL owners can win £100 of Computer One software, consisting of Pascal, Forth and an Assembler.

Wargaming can be a lot of fun, but computerized war simulations are also used for more serious matters, such as trying out new battle tactics or testing the likely effect of new ▶





3

```
  10 REM *** TANK DRIVE *** <133>
  20 REM (Sinclair Answers Competition) <233>
  30 REM ------------------------------ <217>
  40 CLS : PRINT "PLEASE WAIT FOR MAP DATA" <029>
  50 REM Read the map data <193>
  60  RESTORE 1020 <011>
  70 DIM m(26,26) <244>
  80 FOR r=1 TO 26 <015>
  90 READ r$ <230>
 100 FOR c=1 TO 26 <042>
 110 IF r$(c)="P" OR r$(c)="B" THEN  LET m(r,c)=1 <003>
 120 IF r$(c)="D" THEN  LET m(r,c)=2 <177>
 130 IF r$(c)="F" THEN  LET m(r,c)=3 <073>
 140 IF r$(c)="W" THEN  LET m(r,c)=4 <086>
 150 IF r$(c)="S" THEN  LET m(r,c)=5 <072>
 160 IF r$(c)="M" THEN  LET m(r,c)=6 <096>
 170 NEXT c <052>
 180 NEXT r <059>
 190 REM ------------------------------ <121>
 200 REM Set up movement offset array <001>
 210 RESTORE 260 <014>
 220 DIM o(4,2) <110>
 230 FOR i=1 TO 4 <139>
 240 READ o(i,1) , o(i,2) <047>
 250 NEXT i <110>
 260 DATA -1,0,0,1,1,0,0,-1 <131>
 270 REM ------------------------------ <200>
 280 REM Set move count variable to zero <208>
 290 LET count=0 <176>
 300 REM Set movement cost variable to zero <155>
 310 LET total cost=0 <149>
 320 REM Set Evaluation Weights <153>
 330 LET WEIGHT1 = 5 <150>
 340 LET WEIGHT2 = 1 <139>
 350 REM ------------------------------ <152>
 360 REM Get start (r1,c1) and end (r2,c2) coordinates
<226>
 370 READ r$,c1 : LET r1=CODE (r$)-64 <162>
 380 READ r$,c2 : LET r2=CODE (r$)-64 <172>
 390 DATA "Z",26,"A",1 <109>
 400 REM ------------------------------ <086>
 410 REM ** EVALUATE AND PRINT MOVES ** <063>
 420 REM  <064>
 430 REM Calculate distance to target <059>
 440 LET old dist=SQR (ABS (r1-r2)^2+ABS (c1-c2)^2) <13
9>
 450 REM Set best score to dummy value <041>
 460 LET best score=-99 <018>
 470 REM Update move so far <077>
 480 LET count=count+1 <032>
 490 PRINT "Move ";count;":" <072>
 500 REM ------------------------------ <050>
 510 REM First square look-ahead <025>
 520 FOR a=1 TO 4 <111>
 530 LET x1=r1+o(a,1) : LET y1=c1+o(a,2) <062>
 540 IF FN o(x1,y1) THEN  GO TO 820 <048>
 550 LET ac=m(x1,y1) <171>
 560 IF FN f(x1,y1) THEN  LET score=9999-WEIGHT2*ac: GO
SUB 97990: GO TO 820 <246>
 570 REM Second square look-ahead <183>
 580 FOR b=1 TO 4 <032>
 590 LET x2=x1+o(b,1) : LET y2=y1+o(b,2) <114>
 600 IF FN o(x2,y2) THEN  GO TO 810 <105>
 610 LET bc=m(x2,y2) <236>
 620 IF FN f(x2,y2) THEN  LET score=9999-WEIGHT2*bc: GO
SUB 990: GO TO 810 <196>
 630 REM Third square look-ahead <139>
 640 FOR c=1 TO 4 <229>
 650 LET x3=x2+o(c,1) : LET y3=y2+o(c,2) <182>
 660 IF FN o(x3,y3) THEN  GO TO 800 <174>
 670 LET cc=m(x3,y3) <017>
 680 IF FN f(x3,y3) THEN  LET score=9999-WEIGHT2*cc: GO
SUB 990: GO TO 800 <010>
 690 REM Fourth square look-ahead <061>
 700 FOR d=1 TO 4 <222>
 710 LET x4=x3+o(d,1) : LET y4=y3+o(d,2) <250>
 720 IF FN o(x4,y4) THEN  GO TO 790 <218>
 730 LET dc=m(x4,y4) <082>
 740 IF FN f(x4,y4) THEN  LET score=9999-WEIGHT2*dc: GO
SUB 990: GO TO 790 <113>
 750 REM Calculate and update best score <124>
 760 LET new dist=SQR (ABS (r2-x4)^2+ABS (c2-y4)^2) <19
5>
 770 LET score=WEIGHT1*(old dist-new dist)-WEIGHT2*dc <
152>
 780 GO SUB 990 <007>
 790 NEXT d <140>
 800 NEXT c <189>
 810 NEXT b <182>
 820 NEXT a <171>
 830 REM Update total cost <145>
 840 LET total cost=total cost+m(row,col) <201>
 850 PRINT " From: ";CHR$ (r1+64);",";c1;" to: ";CHR$ (
row+64);",";col <229>
 860 PRINT " (Total cost = ";total cost;")" <185>
 870 PRINT  <159>
 880 REM Update start square <209>
 890 LET r1=row : LET c1=col <100>
 900 REM Check if still travelling... <067>
 910 IF NOT FN f(r1,r2) THEN  GO TO 440 <238>
 920 REM ...else found target. <019>
 930 PRINT  INK 2; FLASH 1;AT 21,11;"Found HQ !!" <134>
 940 STOP  <066>
 950 REM On/Off board function <124>
 960 DEF FN o(x,y)=(x<1 OR x>26 OR y<1 OR y>26) <239>
 970 REM Target found function <124>
 980 DEF FN f(x,y)=(x=r2 AND y=c2) <128>
 990 REM Update best score subroutine <071>
1000 IF score>best score THEN  LET row=x1 : LET col=y1
: LET best score=score <024>
1010 RETURN  <000>
1020 REM Map data <126>
1030 DATA "PPPPMMMMMMFFFFFFFFWPPFFFFFF" <228>
1040 DATA "PPPMMMMMMPFFFFFFFFWPFFFFFF" <228>
1050 DATA "PPPPPPPPPFFFFFFFFPWPFFFFFF" <238>
1060 DATA "PMMMMMPPPFFFFFFFFPBPPFFFFF" <216>
1070 DATA "MMMMMMMPPPPPPFFFPPWPFPFFFF" <199>
1080 DATA "MMMMMMPPPPPPPPPPPPWFFFFFFF" <204>
1090 DATA "MMMMPPPPPPPPPPPPWWFFFFFFF" <177>
1100 DATA "MMMPPPPPPPPPPPPWWSFFFFFFF" <161>
1110 DATA "MMPPPPPPPPPPPPWWWSFFFFPFF" <161>
1120 DATA "PPPPPPPPPPPPWWWSSSSFFFPFF" <148>
1130 DATA "PPPPPPWWWWWWSSSSSSSFFPFFF" <139>
1140 DATA "PPPPPWWWWWPWWWWSSSSSFPFFF" <132>
1150 DATA "WWWBWWPPPPPPPPPWWWWSFFPFF" <138>
1160 DATA "WWWBWPPPPPPPPPPPPWWWWBWW" <123>
1170 DATA "PPPPPPPPPPPPPPPPPPPPPPPW" <102>
1180 DATA "PPPPPPPPPPPPPPPPPPPPPPPP" <111>
1190 DATA "MMPPPPPPPPPPPPPPPPPPPPPP" <085>
1200 DATA "MMMPPPPPPPPPPPPPPPPPPMPM" <072>
1210 DATA "MMMWPMMMPPPPPPPPPPPPPMMPM" <083>
1220 DATA "MMWWMMMMMMFPPPPPPPPMMMMMPM" <060>
1230 DATA "MMWMMPPPMMMPMFFFMMMMMMDDD" <037>
1240 DATA "MMWMMPPMMDDDMMMMMMMMDDDDD" <049>
1250 DATA "MWWMMMMMMDDDDDDDDDDDDDDDD" <024>
1260 DATA "MWWMMMMMMDDDDDDDDDDDDDDDD" <022>
1270 DATA "MWMMMMMMDDDDDDDDDDDDDDFWD" <014>
1280 DATA "MMMMMMDDDDDDDDDDDDDDDDD" <251>
```

2

Terrain:		Movement (time in hours):
Plain	(P)	1
Path	(P)	1
Bridge	(B)	1
Desert	(D)	2
Forest	(F)	3
Water	(W)	4
Swamp	(S)	5
Mountain	(M)	6

4

Route Number:	From:	To:
1	Z 2	P 13
2	P 13	Q 24
3	Q 24	D 15
4	D 15	Z 2

COMPETITION

Problem One: Having typed in the listing, run it so that the tank travels from Z 26 to A 1. The total time in hours for this journey will be a prime number, the answer to the first problem. If you don't get a prime number, then you've obviously made a mistake somewhere when typing in the listing. Check it carefully, being very careful to type in all the map characters correctly.
The answer to Problem One is this prime number.

Problem Two: To start with, you must change the program listing which you have just typed in, so that the tank will only look ahead three squares, instead of four. This should have the beneficial effect of speeding up the time it takes to choose a move by a factor of about four, so you won't have to wait quite so long. Second, change the value of WEIGHT2 (in line 320) to eight. For this part of the problem, the tank must make a circular route, passing through the coordinates given in *Fig. 4*; in other words, the tank starts at square Z 2 and travels through P 13, Q 24 and D 15 (in this order), to finally end where it started at Z 2. Given that the value of WEIGHT2 is *eight*, what value should be given to WEIGHT1 so that the tank makes the complete journey in the least number of hours? This is not to say that the tank will take the optimum route, but that no other value for WEIGHT1 will enable it to find a shorter one.

The answers to this part of the problem are the value given to WEIGHT1 (remember, only one value for the whole route) and the total number of hours taken with this value.

Rules:
1: The competition is open to all readers of *Sinclair Answers*, unless they are employees of VNU BV or their relations.
2: All entries must be sent to: ***Sinclair Answers,*** Tank Drive Competition, 62 Oxford Street, London W1A 2HG.
3: The editor's decision is final.

To enter, simply place your answers on the entry form. The competition is open to all Spectrum and QL users. The first two correct entries, using Spectrum micros, drawn out of the editor's tin helmet will each win a Cheetah 68FX1 keyboard and a Rotronics Wafadrive (both reviewed in this issue). There will be a similar draw for entries using the QL computer, the winners receiving £100 worth of Computer One software (Pascal, Forth and an Assembler).

In the event that there are too few correct entries, the entries with the nearest answers will be considered. All entries must arrive by first post on Monday 4th February 1985.

equipment without having to build it. Automation in battle equipment is already quite high, and will increase still further over the next few years. So we decided to take a glimpse into the future, where battle tanks are endowed with their own minor intelligence.

Study the 26 × 26 square map on the previous page (*Fig. 1*) and imagine yourself sitting in an amphibious battle tank, positioned at square Z 26. An incoming message informs you that the enemy headquarters has been sighted at A1. Your mission (should you choose to accept it) is to travel to and destroy the target as quickly as possible. So off you go, up hill and down dale, until you eventually reach your destinaation. However, each time you move into a new square on the map, the time it takes to move over that particular square of terrain (shown in *Fig. 2*) is added up. This then represents the total number of hours of travelling time.

For example, travelling from any square into a mountain location, followed by a square containing a path would take you seven hours. That is:

Hours = Mountain + Path
= 6 + 1
= 7

Of course, you could take the most direct course towards the target, but you're probably going to get there quicker if you try to take advantage of the terrain features. The listing given in *Fig. 3* will simulate your journey and try to make intelligent decisions when choosing the best route to the target. This program has been written using a 48K Spectrum, but could easily be adapted for use on other Sinclair computers.

First of all you must type in and run the listing as given. In deciding each move, the battle tank will look at the terrain features up to four horizontal or vertical moves ahead (lines 490 to 800). It then assigns a score to each of the positions which can be reached. This score is based upon: the distance from the target; and the time it takes to reach the position (in hours).

These two values are 'weighted' by the variables WEIGHT1 and WEIGHT2 which are initialised in lines 310 and 320 respectively (weighting is simply a method of assigning an importance to each of the two calculations). Having calculated the scores for all reachable positions, the battle tank will move to the first square of the sequence with the highest score. This continues until the tank reaches its target. Now consider the following problems given in the box shown above.

Hopefully you'll find our competition an enjoyable challenge. If you find it brings out the commander in you, why not try our *Assault* game listing in this issue?

By Marcus Jeffery, technical writer.

ENTRY FORM:

Problem One:
Travel time = _____ hours

Problem Two:
Weight 1 = _____
Travel time = _____ hours

NAME:_____ DAYTIME PHONE NUMBER: _____

ADDRESS: _____

COMPUTER USED: _____

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SA?

PASCAL TO THE RESCUE

QL PASCAL POSES A WELCOME ALTERNATIVE TO SUPERBASIC.

The Superbasic that the Sinclair QL arrived with left a lot to be desired, and it's taken time for alternative independent software to emerge to help overcome it. The release of Pascal for the QL, from Computer One, goes a long way to making the most of the machine's 68008 CPU.

Together with the screen editor, the whole package is menu driven, and offers the programmer an opportunity to write in a more structured language than Superbasic. And if that is not enough to satisfy you, then perhaps it's speed will.

Computer One Pascal (CO Pascal) consists of an 87 page user manual and a Microdrive cartridge. It is very close to the ISO standard with some omissions (such as not being able to pass functions and procedures as parameters), but on the whole nothing to worry about. On the plus side, many new procedures and functions have been added to the language — QL graphics handling is one example.

Access to all QL I/O is catered for, including screen, keyboard, serial ports, Microdrives (up to eight), and so on. Compared to the 'standard', file handling has been considerably simplified with the non-standard CO Pascal word 'reset'. Reset assigns a file to a filename which can be any valid QL device. This flexibility means that 'serious' data file handling can be considered.

As previously mentioned, many features of Super-Basic have been incorporated into CO Pascal in the form of procedures and functions. These are broadly broken up into three groups: graphics, memory management and miscellaneous.

The largest group consists of graphics handling, and includes all the features to be found in SuperBasic. All parameters must be specified when using a feature and many need a file name parameter which is a string. For example, in Superbasic the full syntax for the PAPER statement is 'PAPER channel, colour, contrast, stipple'. In CO Pascal all the parameters must be specified and the syntax is 'PAPER (file, colour, contrast, stipple);'. The file would be previously 'attached', the file variable declared as a string.

Memory management is provided for with 16 procedures and functions. The SuperBasic equivalents of PEEK, POKE and CALL are provided, with others as well. Two procedures, FILL and MOVE allow specified areas of memory to be filled with data. The address of a CO Pascal variable (any type) may be found by the use of LOC, and files may be read / written at byte level with GETBYTES and PUTBYTES.

Other miscellaneous functions and procedures allow for sound, bell, and data interogation, checking to see if a character is upper case, and suchlike. The clock may be set, altered and read, and there is a host of boolean operators available.

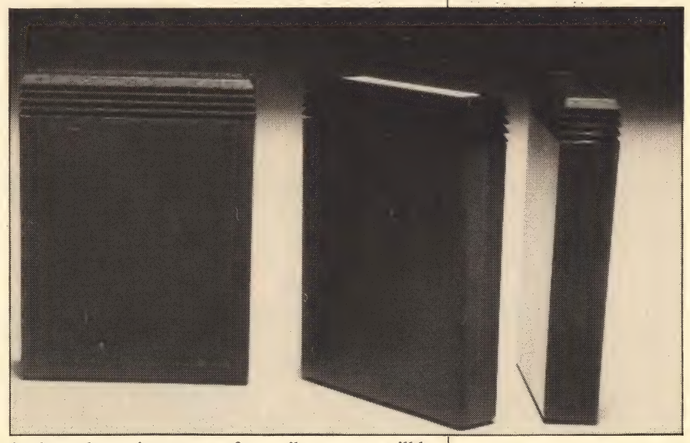
Once the CO Pascal is loaded, the user is confronted with the interpreter. The whole package is menu driven, and there is no need to remember commands as options can be selected by cursor key or number. At the 'top' of the user-interface is the front-end menu which has options to enter the editor, compile, run, copy, format and delete. Windowing is used throughout, and in the case of the initial menu, the options are displayed on the left with user input and system responses displayed to the right.

The screen editor provided is simple to use, which is what you want. Various options allow source code to be saved with editing resumed, and so on. Once back at the main menu; the source code is compiled, and depending on what compiler options were chosen in the code, various types of compiler reports will be given. The intermediate code that is automaticaly saved with the extension '_qlp', and will be run if the run option is chosen.

FIG. 1

```
program test;
var
  i:integer;
  r:real;
begin
  write('Processing....');
   for i:=1 to 1000 do
    begin
     r:=i;
     r:=cos(i);
     r:=sin(i)
    end;
  writeln('complete.');
end.
```

Left: an example Pascal listing; below: Microdrive cartridges on which Computer One Pascal is based.



Performance-wise, we were also quite happy. CO Pascal is much faster than SuperBasic (Computer One claiming 50 to 100 times); but the real benefit (and joy) of using this package was the fact that Pascal is a lot more structured than SuperBasic.

The package could be easily used for educational purposes. If you are learning Pascal at school, college or just for yourself, then take a good look at CO Pascal. The object code produced by the compiler is intermediate and will not run without the interpreter, however, Computer One informed us they they are developing a software module that will enable the object code to be run seperately, thus allowing commercial software to be produced.

By David Janda, a freelance journalist.

Computer One Pascal VO. 1 (priced £39.95) is available from:
Computer One,
Science Park,
Milton Road,
Cambridge CB4 4BH.

THE INDEPENDENT HOME-MICRO NEWSLETTER



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Nowhere will you find more about who's doing what to whom, success, pending success or failure. Also if you don't know what Sir Clive's nickname was at school or that the new President of Atari was once a New York cabbie; the **Home Micro** Diary Page tells all.

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We are **not** a technical journal. BUT every month we print an 'easy to read' chart that gives you everything you need to know about . . . what's new, what it does, where to get it and how much. Plus, we offer our own short comments on value and usability. Everything from complete computers to carrying cases is covered.

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Date Signature

OR Please debit my Access Card No.

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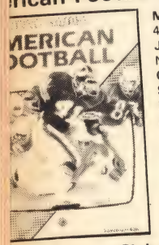
the sum of £12.00 on 15 February 1985 and thereafter £17.50 on the same date each year until countermanded by me.

Date Signature

HOW TO SAVE £££'s ON THE COST OF SOFTWARE AND HARDWARE 'ADD-ONS'

LOGIC 3

erican Football



Machine: 48k Spectrum
Joystick: No
Category: Strategy
Publisher: Argus Press

e: £9.95 **Club price: £8.45**

erican Football is a strategic lation, with fast animated hics. You do not control idual players but instead the le team responds to your uctions.
he action takes place on the h which occupies the top of the een. Beneath the pitch is the reboard that gives all the relevant rmation: the quarter being yed; minutes remaining, etc. This lso where you enter your mmands. Play can be against the mputer or another opponent. complex game, but nevertheless eat fun to play, supplied with a full ide to American Football and mprehensive instructions.

tings: /10
aphics: 7
ound: 6
olour: 6

Originality: 9
Interest: 7
Order code: AMEFO

ool



Machine: ZX Spectrum, 16/48k
Joystick: No
Category: Simulation
Publisher: CDS Micro Systems

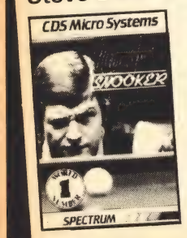
Price: £5.95 **Club price: £4.45**

A really excellent simulation of the game of Pool using the full sound and colour graphics capabilities of the Spectrum to bring the action and excitement of the real game into your home. Use your skill and judgement, and play like the prpfessionals. 1 or 2 player game and demo mode. The *only* pool game worth considering for your 16 or 48k Spectrum.

Ratings: /10
Graphics: 8
Sound: 8
Colour: 8

Originality: 9
Interest: 10
Order code: POOL

Steve Davis Snooker



Machine: 48k Spectrum
Manufacturer: CDS Microsystems

BONUS £5.45 PRICE

Price: £7.95 **Club price: £6.75**

After the incredible success of Ocean's Decathlon, which must in

comes "Steve Davis Snooker". Apart from his signature on the cover there are no other signs of intererence by Steve, but that doesn't in any way detract from the game, which is an excellent piece of programming. A feature we liked—though it is cheating a bit—is that you can go back and re-take your last shot! When you've just sunk the black when you were aiming for the yellow that's a useful feature! Ball control is excellent. You have full control over angle, power and spin and the movement is really smooth. With Currah speech connected the referee makes comments like "Ladies & Gentlemen quiet please", or "foul", plus a few others that are totally incomprehensible.
All in all this is an excellent simulation with smooth movement and very controllable ball action.

Ratings: /10
Graphics: 8
Sound: 8
Colour: 7

Originality: 8
Interest: 9
Order code: SDS

ARCADE SIMULATION

Do you yearn to drive a racing car, compete in the Olympics, or prehaps stand, pint in hand, competing against Eric Bristow and scoring "One hundred and Eighty's" time after time? If so, then you should find an Arcade/Simulation that'll fulfil your ambition—if not in reality, then in excitement and fun. Here we give a selection of the best—chosen not only for their accuracy but also for added touches like the way the athlete reacts to success or failure in Daley Thompson's decathlon, or the scurrying around of the ball-boys in Match Point. Features like these demonstrate imagination on the part of the author just as much as programming skills.

Beach Head

Joystick: Optional and redefineable keys
Category: Arcade Simulation Strategy
Publisher: Access

Price: £7.95 **Club price: £6.45**

Beach Head is a potent combination of arcade action, simulation and strategy, resulting in one of the most exciting *and* most realistic games currently available for the Spectrum. As Admiral of the Fleet, you have to decide between a full frontal assault or whether to try a surprise attack, sending your fleet down a side channel which may be mined. As naval gunman, you face constant harassment from enemy fighters as you try to establish the range of the enemy's ships. Finally, as tank commander, you have to fight your way through the enemy hald beach. If you like action you *must* get this game.

Ratings: /10
Graphics: 10
Sound: 10
Colour: 10

Originality: 10
Interest: 10
Order code: BEASP

Chequered Flag

Machine: 48k
Joystick: None
Category: Simulation
Publisher: Psion/Sinclair

BONUS £2.95 PRICE

Price: £6.95 **Club price: £5.45**

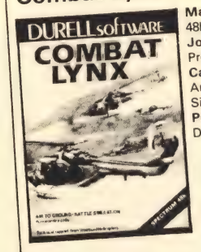
The most sophisticated motor

Spectrum. Choose from ten tracks including Monaco, Brands Hatch and Silverstone and from three cars, one automatic and 2 with manual gearchange. Instruments include speedo, rev counter and fuel guages. As you drive around the 3D track you can see the nose of your car, the wheels and steering wheel turning, and the road ahead.
Very impressive 3D graphics, if you enjoy 3D simulations, you must add Chequered Flag to your collection.

Ratings: /10
Graphics: 9
Sound: 5
Colour: 6

Originality: 9
Interest: i0
Order code: CHEFL

Combat Lynx



Machine: 48k Spectrum
Joystick: Protek
Category: Arcade/ Simulation
Publisher: Durrel Software

BONUS £5.95 PRICE

Price: £7.95 **Club price: £6.75**

Probably the most comprehensive real-time battle simulation available for your home computer. Combat Lynx can be played simply as an arcade game or more complexly as an arcade simulation. In the air-to-ground battle you are at the controls of a Lynx helicopter. You can select anti-tank, anti-aircraft missiles, machine guns or mines to arm your 'copter with. Your mission is to support your ground forces and to protect your ground bases. The number of bases depends on which of the 4 skill levels you choose.
From the pilot's seat in your Lynx you get a spectacular 3D view of the landscape and enemy troops. Around your view panel there are comprehensive instruments showing altitude, temperature, speed, fuel, weapon and navigation information.
An excellent 3D game featuring very smooth, realistic graphics. Recommended.

Ratings: /10
Graphics: 9
Sound: 8
Colour: 8

Originality: 9
Interest: 8
Order code: COMLY

Daley Thompson's Decathlon



Machine: 48k
Joystick: Kempston Sinclair
Category: Arcade
Publisher: Ocean

BONUS £4.95 PRICE

Price: £6.90 **Club price: £5.85**

Competing against the computer you are Daley Thompson, facing ten gruelling events.
On the first day you can choose to compete in the 100 metres, long jump, shot-put, high jump and 400 metres. The second day's events are the 110 metres hurdles, discus, pole-vault, and the 1500 metres.
In the running events you animate Daley by either pressing two keys alternately, or rapidly moving the joystick from side to side. In the hurdles you press the fire button to jump. The throwing events require a little more skill and timing and a little less finger stamina!! In the long jump, after a good run up try to get a take-off angle as near to 45 degrees as possible. In the high jump, judge your take-off and the right time to fall, without knocking off the bar. In the pole-vault get the pole as close to 90 degrees as you can and plant it in the right place. In the javelin and discus work up a really powerful throw and remember to release it on time! There is a comprhensive on screen score board showing world records, qualifying times, etc. the graphics and animation are good and keyboard play is very responsive. Novel touches, like the officials coming out and measuring long jumps, the crowd cheering, and Daley scratching his head or leaping around, add to the enjoyment of a good game.

Ratings: /10
Graphics: 8
Sound: 7
Colour: 8

Originality: 6
Interest: 9
Order code: DALSP

Dartz



Machine: 48k
Joystick: No
Category: Simulation
Publisher: Automata

Price: £5.00 **Club price: £4.00**

At last—a good simulation of darts for your home computer. Aim carefully at the board but take into account the number of pints you've had tonight, and the crowd

g altitude, temperature, fuel, weapon and navigation ation.
An cellent 3D game featuring ve smooth, realistic graphics. R mmended.

s: /10
G ics: 9
S d: 8
C ur: 8

Originality: 9
Interest: 8
Order code: COMLY

ley Thompson's ecathlon



Machine: 48k
Joystick: Kempston Sinclair
Category: Arcade
Publisher: Ocean

BONUS £4.95 PRICE

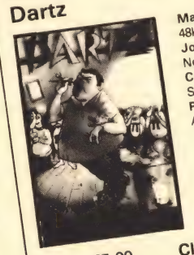
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Ratings: /10
Graphics: 8
Sound: 7
Colour: 8

Originality: 6
Interest: 9
Order code: DALSP

Dartz



Machine: 48k
Joystick: No
Category: Simulation
Publisher: Automata

Price: £5.00 **Club price: £4.00**

At last—a good simulation of darts for your home computer. Aim carefully at the board but take into account the number of pints you've had tonight, and the crowd

efeat them. This is a l new adventure from nd the elaborate ons of the many locations llent once again. From ic encounters with , through the bustle of a Market town to the Middle d beyond to the future, ne is a must for history nd frustrated time-travellers

: /10
s: N/A
lity: 8
t: 9

Order code: LOTSP

ania



Machine: 48k
Joystick: No
Category: Adventure
Publisher: Automata

BONUS £4.95 PRICE

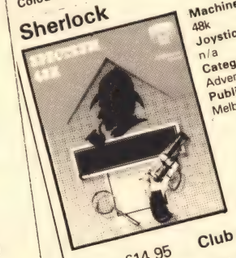
rice: £10.00 **Club price: £7.50**

cult adventure from Automata hat will keep you busy for months? No, probably years. eaturing the Pi-Man and some very high quality, amusing graphics too (also a free hit single and a chance to win £6,000).

Ratings: /10
Graphics: 7
Sound: 4
Colour: 4

Originality: 8
Interest: 6
Order code: PIMAN

Sherlock



Machine: 48k
Joystick: n/a
Category: Adventure
Publisher: Melbourne House

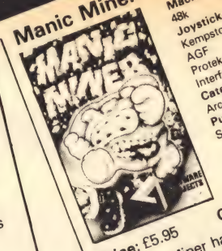
Price: £14.95 **Club price: £12.95**

Not at all elementary, my Dear Watson!
You play the character of Holmes, while other characters behave according to their own personality. The game uses a technique called 'Inglish' which allows you, Holmes, to talk to the other characters to obtain information and crack the case! Throughout the game, time is displayed by a clock on the screen and the detail is unbelievable; for instance you can travel from Baker Street in a taxi to your destination but you must call the taxi, tell him your direction of travel and then pay him! The large vocabulary allows many different commands to be given, but you must remember to leave time for Holmes to sleep! The game shows both text and graphical representation on the screen and can last for up to a month by saving it after each session. Superb entertainment, brilliantly absorbing!

Ratings: /10
Graphics: 7
Sound: n/a
Colour: 8

Originality: 10
Interest: 10
Order code: SHERL

Manic Miner



Machine: 48k
Joystick: Kempston AGF Protek Interface II
Category: Arcade/Adventure
Publisher: Software Projects

Price: £5.95 **Club price: £4.55**

Willy the Miner has fallen down a disused mine shaft. He works his way through the various levels collecting keys and searching for secret treasure. Manic Miner is a classic arcade game for the Spectrum—There are 20 caverns to penetrate, each requiring its own bit of ingenuity to ensure success. A classic game that sets the standard others will be judged by.

Originality: 9
Interest: 9
Order code: MANSP

Mugsy



Machine: 48k
Joystick: No
Category: Strategy
Publisher: Melbourne House

BONUS £4.95 PRICE

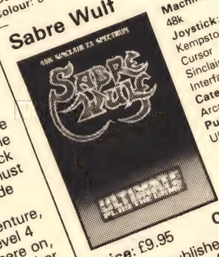
Price: £6.95 **Club price: £5.55**

From the publishers of the top selling adventure—The Hobbit—comes their newest release, MUGSY. The game can best be described as a comic strip featuring animated characters. As Mugsy, you must organise your gang and their dealings—protection rackets and the purchase of weapons and ammunition, and most important of all make sure that your gang stays on top.
Muscle in on the action!

Ratings: /10
Graphics: 9
Sound: 9
Colour: 8

Originality: 10
Interest: 9
Order code: MUGSY

Sabre Wulf



Machine: 48k
Joystick: Kempston Cursor Sinclair Interface II
Category: Arcade/Adventure
Publisher: Ultimate

Price: £9.95 **Club price: £8.45**

From the publishers of Spectrum classics such as Atic Atac and Lunar Jetman now comes SABRE WULF, an arcade/adventure epic set in the deepest jungle.
The deeper you explore, risking life and limb, the more challenges you face: hippos, rhinos, warthogs, tarantulas, bats and at least 30

Originality: 8
Interest: 7
Order code: JOKWI

Price: £8.45

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CHRISTMAS COMPETITION!

LOGIC 3

Spectrum Club

BRITAIN'S No.1 SOFTWARE CLUB

WINTER ISSUE 1984/85

WIN A MICRODRIVE



Christmas Competition

1st prize: ZX Microdrive & ZX Interface 1 (worth over £70)

2nd prize: Currah µSpeech Synthesizer (worth £29.90)

10 runner up prizes of free games software (each worth over £10)

To Celebrate the Christmas season Logic 3 are running a grand Christmas Competition with a ZX Microdrive and Currah µSpeech Synthesizer as first and second prizes.

The ZX Microdrive, complete with Interface 1, is undoubtably the ultimate Spectrum add-on allowing programs and data to be quickly saved and recalled. The Currch µSpeech is both powerful, featuring an infinite vocabulary, and easy to use.

To enter the competition carefully read the reviews in this catalogue then answer the questions in the Quiz and mail your answers to Logic 3. All entries received before 31st January will be eligible for the competition. Prizes will be awarded to the first 12 correct entries drawn.

Here's your chance to win these desirable Spectrum add-ons, but don't leave it too late, make sure, your entry reaches Logic 3 before the closing date!

CLUB SUCCESS

The Logic 3 Spectrum Club was launched in July, 1984 and has been an outstanding success. Already more than half-way to its target of 10,000 members in twelve months, the continuous growth of the club has kept Logic 3's staff working seven days a week just to keep up with demand.

Tony Toller, Logic 3's managing director and coordinator of the Club, explains its success as follows: "With other clubs once a person has joined there is no more reason for the club to try to support its members who each month *have* to purchase a certain number of products from a short list. Our Club is different. Members have no obligation to purchase *any* products from the club so the pressure is on us to choose only the best quality products and offer the best possible prices. We also take a lot of pride in publishing independent reviews on all the products we carry and if we do not like something about a product we are not afraid so say so." Tony Toller's policy of offering Club members a real service rather than just running "yet another mail order business" is winning new members all the time. But size by itself is not the main objective "as we grow so we will be able to improve our service to members still further and perhaps, one day, develop the club catalogue into a proper magazine." With the Christmas edition of the catalogue already running at a bumber 20 pages containing reviews of more than 180 products that day

INSIDE

★ **EDUCATION**
A selection of the most effective educational program available. Designed for children from th age of 4 to 16.

★ **GAMES**
The best games for the Spectrum selected by our o review panel and rated according to: graphics, sou colour, originality and inte

★ **PROGRAMMING**
The 'Learn BASIC' tutoria really show you how to w structured programs in e understand stages.

★ **UTILITIES**
Design your own games

★ **HARDWARE**
Some good deals in ha and peripherals.

LOGIC 3's SOFTWAR PANEL

Neil Atkinson, pupil of Borlase School, spend weekends in a shop s computer software, i work as a journalist.

Andrew Goltz, direct spent 6 years with C UK and Internationa instigated Commod 'Approved Product' third party software

Bliss Healey, gradu School of Econom translated busines French, currently design of graphic software.

Tony Toller, dire former journalis business applic and co-ordinato software club.

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ILLUSTRATION BY NICK NEWMAN

'When they said "Allow 28 days for delivery" I didn't realise they meant the answers to questions!'

Using a little foresight and knowledge, it is quite possible to improve the efficiency of your Basic programs.

Basic, and in particular Spectrum Basic, is not renown for its speed of execution; but it is quite straightforward, using a little foresight and knowledge, to significantly improve the efficiency of your programs, without resorting to the intricasies of machine code.

Here are a few useful hints to aid you in this, together with a process aimed at determining which routines slow the execution of your own programs; in addition, a method is given for jumping to a statement other than the first in a line.

Every program uses GOTOs and/or GOSUBs. They are indispensable and in particular, subroutines improve the readability of a program. Structured programming and modular program design both rely heavily on the use of subroutines. However, several questions arise. How can GOSUBs and GOTOs be made more efficient? How do they compare?

Look at the following routines, each of which employs a GOTO statement in a FOR-NEXT loop, the only difference being the position of the statement referred to by the GOTO command:

```
(1A:)
50 FOR n = 1 TO 1000
60 GOTO 70
70 NEXT n
```
Time taken = 67.66 secs.
```
(1B:)
50 FOR n = 1 TO 1000
60 GOTO 1000
 .          ↑
 .     68 REM STATEMENTS
 .          ↓
1000 NEXT n
```
Time taken = 115.6 secs.

The difference in time is quite significant, and there are several points to be learnt from this. One obvious lesson is to minimise the use of REM statements, but more importantly, reduce the distance between the start of your program and the line you are jumping to, or, eliminate the jump entirely. In addition, if the jump is the result of an IF "CONDITION" THEN GOTO statement, make the condition true for the case which occurs less frequently. Now consider the following routines using GOSUBs.

```
(2A:)
  5 RETURN
20 REM Timing Statements (and start with RUN 20)
50 FOR n = 1 TO 1000
60 GOSUB 5
70 NEXT n
```
Time taken = 7.66 secs.
```
(2B:)
  50 FOR n = 1 TO 1000
  60 GOSUB 1000
  70 NEXT n
  90 STOP
  68 REM STATEMENTS
1000 RETURN
```
Time taken = 13.28 secs.

A similar trend to programs 1A and 1B is shown. Obviously it is beneficial to keep both the subroutine and the GOSUB as near as possible to the beginning of your program.

Whenever a jump is made, the destination line number is stored in the system variable "NEWPPC". In the case of a GOSUB, the line number of the statement to return to, and the position of that statement within the line, are stored on the GOSUB stack, which effectively starts at address 65365 and grows downwards (for 48K Spectrum at normal RAMTOP).

The interpreter, knowing the destination ▶

line number, then searches through the "BASIC PROGRAM" area in memory for that line, starting at the beginning; hence the nearer the line to the beginning of the program, the faster the jump is made. In the case of GOSUB, the same search is carried out for the RETURN statement, so this should also be taken into consideration.

An interesting feature is that by POKEing several system variable locations, it is possible to jump to a statement other than the first statement in a line, as follows:

○ POKE The destination line number into the two byte system variable "NEWPPC". This occupies addresses 23618 and 23619, the less significantly byte being stored in the lower address.

○ POKE The statement number within the line into the system variable "NSPPS" which occupies address 23620 (for example, GOTO the 5th statement in line 1000), such as:

```
NEWPPC    POKE 23618, 1000 – 256*INT (1000/256):
          REM or POKE 23618,232
          POKE 23619, INT (1000/256):
          REM or POKE 23619,3
NSPPS     POKE 23620,5
```

Note that GOTO 1000 is not required, that this cannot be done with GOSUB, and that POKEing the system variables for a jump to the first statement on a line is slower than an actual GOTO statement.

When assigning names to variables a good choice of names for variables are those that recall the meaning of the variables. Names such as "XMIN", "COUNT", and so on, are frequently encountered in programs. Unfortunately, the length of the variable name affects execution time, as the following program demonstrates:

(Program 3:)

```
50 "VARIABLE" = 1
60 FOR n = 1 TO 1000
70 LET "VARIABLE" = "VARIABLE" + 0
80 NEXT n
```

The results of this are given in *Fig. 1.*

Clearly, the use of single character variable names improves efficiency. However, longer names do improve readability, and certainly help during debugging. For longer programs, an explanation of each variable can be embedded in REM statements, placed after the last executable statement, so not affecting efficiency.

Most texts on programming stress the importance of brackets in a mathematical expression, and generally add that if you are unsure whether brackets are needed for correct evaluation, then add them. Brackets certainly make an expression more readable, but again they affect execution time. For example:

(Program 4:)

```
40 LET a = 2.1 : LET b = 5 : LET c = 2.33 :
LET d = 9 : LET e = 900.21 : LET f = 6.09
50 FOR n = 1 TO 1000
60 LET x = (( a/b) + (c/d) + (e*f))
70 NEXT n
```

Time taken = 23.12 secs.

Removal of all the brackets in line sixty reduces execution time to 21.44 secs. Obviously in this case the brackets are superfluous and the example is rather crude, but it does illustrate the point.

You might now well be thinking that the only way to speed up your Basic program is to use single character variables, without brackets, eliminate every REM statement and put all the GOTOs, GOSUBs and subroutines at the beginning.

The main point that has been illustrated is that you should think carefully about the control flow in your program, and then apply the above rules selectively. A subroutine that is used frequently should be placed near the start, together with its GOSUB (where possible), a much used variable should have a single character name. Multi-statement lines also save time, whereas excesses of REM statements waste it.

Finally, it is worth discovering which routines in your programs take longer to execute, and then try to improve them. The following system explains how to time various sections of your own program utilising the Spectrum's built-in clock, a similar routine was used for this article.

The three byte system variable "FRAMES" is used for counting in 50th's of a second and is stored in addresses 23672, 23673, 23674. The number stored in 23672 is incremented by 1 every 50th of a second. When it reaches 255 (the maximum number that can be stored in a byte), the next increment takes it back to 0 and at the same time, the value in address 23673 is incremented by 1. Similarly, when the value of address 23673 goes from 255 to 0, the number in 23674 is incremented. For example:

Address:	Time increment (secs):
23672	1/50
23673	256 × 1/50
23674	256 × 256 × 1/50

The numbers will revert back to zero after (255 × 256^2 + 255 × 256 + 256) /50 secs (almost four days), which is probably long enough for our purposes! The idea behind timing a specific section of code is to POKE the locations in the timer to zero before the code, and the PEEK them immediately after the code, hence reading the time taken.

However, as explained in the Spectrum User Manual (Chapter 18), there is a problem. PEEKing the three locations takes a finite time, during which the values are still being incremented. It might so happen that you PEEK 23673 at 0 (during which time PEEK 23672 = 255), but by the time you PEEK 23672, it has been incremented again and now reads 0, thus, the time you read is incorrect. One way of overcoming this is to PEEK the three locations twice in succession and take the larger result.

As explained in the use manual, the following routine does just that:

```
10 DEF FN m(x,y) = (x+y + ABS(x-y) )/2
20 DEF FN u() = (65536 * PEEK 23674 + 256* PEEK
                 23673 + PEEK 23672)/50
30 DEF FN t() = FN m(FN u(), FNu() )
```

Here, Function 'm' returns the larger value of x and z; Function 't' reads the time twice and returns the larger value; Function 'u' converts the numbers in "FRAMES" to seconds. To initialise the timer routine POKE locations 23674, 23673 and 23672 with 0, preferably in this order. To read the time use: LET time = FN t().

This is certainly a more reliable technique than sitting glued to the VDU, armed with a stopwatch.

By Jack Pundick, a computer programmer.

FIG. 1

No of characters in "VARIABLE" name	Time taken (secs):	Difference (secs):
1	7.84	0.36
2	8.20	0.24
3	8.44	0.20
4	8.64	0.24
5	8.88	0.24
6	9.12	0.22
7	9.34	0.22
8	9.56	0.22
9	9.78	0.22
10	10.00	0.22
11	10.22	

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CROZZLE—WIN £15

This issue's *Crozzle* is designed to make use of the resident graphics characters perculiar to the Sinclair Spectrum. These are coded 128-143, and are not part of the standard ASCII set of characters. Each consists of four squares which may or may not be filled in, depending on the code, and they can be displayed on the screen by using the PRINT statement, in the same way that other characters of the set can be (such as capital letters, punctuation, and so on).

You can enter the characters directly from the keyboard when in graphics mode, but for the purpose of this puzzle, you will need to use PRINT in conjunction with CHR$. For example, PRINT CHR$ 134 will display the character consisting of a black square in the top left corner of the print position, and one in the bottom right, the other two squares make up the character remain in the background colour, which is initially white by default.

This is illustrated in *Fig. 1* (left), but the outlines of the character are included to make the diagram clear — since the background colour (which can be changed using the PAPER statement) is initially white, and the foreground colour (which can be changed with the INK statement) is initially black, what you will see on the screen is two small black blobs on a white screen.

As well as encoding the graphics characters, the puzzle also encodes the foreground colour that each character should be displayed in. There are eight colours available on the Spectrum, and each has a number — from 0 (for Black) through to 7 (for white).

The foreground colour can be changed using INK followed by the appropriate number. PRINT INK 4; CHR$ 134, will display the above graphics character as two green blobs on a white background (4 being the number for Green).

You can change the background colour in a similar way using PAPER following by the appropriate number; but for the purpose of this Crozzle, leave the background colour in it's default setting of White, otherwise you will obscure the hidden letters — the graphics characters and foreground colours have been combined to make the hidden letters clear on a white background, and they will be obscured if the background colour is changed.

To build the hidden letters up from the graphics characters, each will need to be printed in it's appropriate position on the screen, as well as being in it's appropriate foreground colour. A fairly straightforward way of achieving this is to use AT in conjunction with the PRINT statement. Thus PRINT AT 3, 4; INK 4; CHR$ 134 will print the character as two green blobs three lines down the screen and four character positions across the screen.

Since the solution of the Crozzle involves repetition of the same processes on similar data elements a set number of times, you will need FOR NEXT loops, and do make use of the facility for defining your own functions (see Spectrum Basic manual, Chapter 9).

Now onto the Crozzle itself. Five letters are hidden in an 8 × 8 grid of graphics characters, shown as *Fig. 2*. Each letter is built up of a number of graphics character, and each graphics character is to be printed in a particular foreground colour.

The data block contains all the information required — each pair of letters contains the information for the corresponding character position in the grid.

The first letter of each pair (upper case) will give the code number for the graphics character to appear at that position. The graphics characters are in the range 128-143 — letter A (ASCII value 65) codes for graphics character 128, (ASCII value 66) for 129 . . . through to P for 143.

The second letter of each pair (lower case) will give the number of the foreground colour for the character — a (ASCII value 97) for colour 0, which is Black, and b (ASCII value 98) for colour 1, which is Blue . . . through to h for White (7).

The way the information is encoded, then, is straightforward, and a couple of functions will crunch through the data so that you can display the resulting 8×8 grid on the screen. What you will get is a mosaic of coloured rectangular blobs (shades of grey on a black-and-white monitor), with nothing remotely resembling any of the letters of the alphabet!

From the first grid, 15 more can be generated following basic rules, and only one of these will display the five letters. To get the next grid, simply add one to each graphics character code, making an adjustment when you shoot out of range; you start at the beginning, that is, code 143 in the previous grid would become 144 (143+1=144). This is out of range of the graphics characters, and so is altered to 128 for the next grid.

The foreground colours also change in a similar manner — add one to each colour number for each character of the previous grid to get the colour for the character in the next grid, with the adjustment that 7, for white, in the previous grid becomes 0, for Black, in the next grid, as (7 + 1 = 8), is out of range for colours. In fact, 8 gives 'transparent', which could prove disasterous for the purpose of solving the puzzle. So a white character in the grid becomes a black character in the next grid.

You don't need a colour monitor, the hidden letters will show up clearly as shades of grey on a white background, but the colour coding is an integral part of the Crozzle — if you ignore it, the letters will be obscured by black blobs.

Crozzle set by Henry Howarth.

Fig. 1:



Fig. 1 (above) shows the basic diagram; Fig. 2 (right) is the block of graphics characters wherein are hidden the five lettes which you need to discover.

```
Ge,Bc,Eh,Mf,Fa,Lh,Hg,Ib
If,Ga,Fb,Ic,Fh,Nf,Ig,Ha
Ia,Gd,Fh,Lc,Nd,Ef,Fe,Mh
Eg,Gf,Fd,Hb,Bg,Pc,Fe,Oc
Da,Eg,Jg,Hh,Da,Md,De,Jd
Hf,Gb,La,Hd,Fa,Og,Gd,Kb
Na,Kc,If,Lc,Kc,Fe,Le,Eh
Ed,Pe,Fg,Gc,Hb,Ef,Lh,Ja
```

Send to: *Sinclair Answers* editoral, Computer 'Crozzle', 62 Oxford Street, London W1A 2HC. The £15 prize winner will be the first correct entry drawn from a hat. The Editor's decision is final. Closing date 31 January, 1985. Winners will be notified by post.

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TROUBLE WITH TV TUNING

My 48K Spectrum works perfectly on a colour TV, but will not work at all on either of my two portable black-and-white TVs. All I get is a rectangle with four vertical black bars equally spaced but no copyright message or I get a 'dead' keyboard. Why?
S W Eckersley, Bradford.

It is a fact that many types of TV are incompatible with the Spectrum. To double check, re-tune the TV using the fine tune controls. If this doesn't work, try the fine tuning screw in the Spectrum — it's a small brass screw near the TV modulator.

If both these fail to connect, we're afraid it's a matter of buying a compatible model — try models by Sony, Baird or Grundig.



PRINTER CONNECT

I have a 48K Spectrum with Interface 1, Microdrive and RS232 lead (9 pin to 25 pin output), and I want to connect a EPSON RX80 F/T printer. I understand I can get it with an RS232 adaption but need an interface. Can you tell me if this is connected with the cable provided by Sinclair, assuming the printer has an 8148 converter built in? Are the control voltages compatible?
C R Bailey, Cumbria.

To use an Epson printer with the Interface 1, it is necessary to have the RS232 option with the printer. A connector will be supplied, and it should be compatible with the RS232 lead that Sinclair supply.

PREVENTING YOUR UNWANTED MERGER

Please could you tell me if there is any way in which I could prevent Basic programs from being merged?
A Hales, Essex.

It is not possible to stop a Basic program from being MERGEd, but it is possible to overcome the problem. The trick is to save your program as a block of code. The following listing will do this:

```
9995  LET  a=PEEK 23653-256*PEEK 23654
9996  SAVE "progname" CODE 23532,a-23500
9997  RUN
```

GOTO line 9995 when you wish to save the program. The user area including system variables and the stacks will also be saved.

When the program is loaded using LOAD "progname" CODE, it will automatically run. Code cannot be merged, so the program should be more secure.

COLOURFUL CONTORTIONS

While working on a program, I pressed several keys absent-mindedly and to my surprise a complete block of listing changed colour. Can you tell me what I'd done, and how can I retrieve it back to black (all subsequent entries were of the new colour).

Also, is there a simple machine or Basic routine that can be added to a BASIC prog in order to disable the BREAK key.
G Warner-Harris, Southampton.

What has happened to your listing is that you have incorporated colour control codes. These codes can be accessed directly from the keyboard, and as well as changing foreground and background colours, other attributes such as FLASH and BRIGHT may also be changed.

To change the listing back to black letters on a white background, you have to delete the control characters that have been incorporated into the listing. To do this, bring the line with the control character into the edit buffer. Then, move the cursor to the character after the first occurence of a control code, and delete one character backwards. This should not delete any keywords, but remove the offending control character instead.

Note that these control codes can be used to 'hide' a listing by making the foreground and background the same colour. A good way to prevent the program being stopped and listed is by POKEing the system variable DF FZ (23659) with 0. When break is pressed, the machine will crash.

ANSWERS

HIDDEN MESSAGE

Is there a simple POKE to stop the prompt 'start tape, then press any key', when saving data to tape? I need to know this as I am trying to put together an adventure game, and it has a lot of data to save.

Also, do you know a good Basic compiler that can handle strings (preferably multi-dimensional arrays) and decimal numbers?
Chris Edwards, Hants.

There is no POKE on the Spectrum that will disable the 'Start tape . . .' message, but it is possible to achieve the same results another way. Just before you load or save, use PRINT#0; INK c; "64 spaces". C is the colour of the PAPER, so when the message appears, it will be invisable because both the foreground and background colours are the same.

RELIABLE ASSEMBLY

Could you recommend a suitable assembler, which costs £15 or less, for the 48K Spectrum?
C Bowler, Derby.

Devpac from Hisoft is probably the best assembler package you can buy for the Spectrum. At £14, it contains two programs, *GENS* and *MONS*. *GENS* is a powerful assembler, and *MONS* is a feature packed machine code monitor. Devpac is used by many software houses to develop their software.

Hisoft,
180 High Street North,
Dunstable,
Bedfordshire. LU6 1AT.
Tel: (0582) 696421.

AUTORUN IN BASIC

How do you make Basic progs run automatically?
Kenneth Jackson, Edinburgh.

To make a Basic program run automatically, it is necessary to use the following syntax when saving the program. SAVE "name" LINE n. Where name is the name of the program, and n is the line number that you wish the program to start from.

MICRODRIVE FILE CHANGE



I am using a large data file on Microdrive as a Diagnostic Index. It is too large to be loaded completely into the Spectrum. I know how to search and add to it (with MOVE), but how do you change or delete records? I have been through three books on Microdrives, who are no help with this.

Dr Gerhard Behr, Lancs.

As long as the data within a file is held in the same format, deleting and amending Microdrive files is no problem. The answer lies in the fact that is it possible to have more than one file open at a time. What you will need to do is write a program that reads records from the first file and transfers them to the newly created second file. As each record is read in, you can delete it simply by not transfering it, or you could examine and modify it and then transfer it. Once this is done for the whole file, delete or backup the first file and use the second as your new master file.

MEMORY MAP

Could you please tell me where the RAM which controls the screen starts and finishes, and could you please recommend a good book on utility routines for a 48k Spectrum. I have tried everything to find this wonderful pocket of RAM, and am now close to packing up.

Ian Grieve, Liverpool.

The RAM used by the Spectrum for the screen display is divided into two areas: the Display file is at addresses 16384-22528, and the attributes are at 22529-23296. The system variables are at 23552– 23734, and several locations within this area control different aspects of the way the screen is controlled. The book *Delaying Deeper into your ZX Spectrum* by Dilwyn Jones, explains in great detail these addresses, as well as lots of routines, and is available from Interface Publications.

HEX CODE INPUT

What do I need in order to type in machine code listings?

Steven Ascroft, Chester.

You must first use an assembler to enter the listing. The Spectrum does not have a built in, so buying an assembler is the only real option. Some publications present machine code listings as a series of decimal or hexadecimal numbers. In this case, all you need to enter the program is a small program which POKEs the numbers into the required memory locations, in which case the program to do this will probably be given as well.

SAVING STRINGS

Could you explain to me how to save strings in a Spectrum program which I want to use as a record for my bank accounts?

Ian Heath, Avon.

Using the syntax SAVE "name" DATA A$, will save the string array corresponding to the letter A.

UNUSABLE INTERFACE

Will Interface 1, Microdrives and the Rotronics Wafadrive work with my 48K Spectrum Mark 1? I have heard from friends that the Mark 1's do not have the correct ROM.

T Asken, Glamorgan.

Your friends are correct — the new versions of the Interface 1 will not work with the Spectrum Issue 1. This is because the ROM in the Interface 1 has been modified and is no longer compatible. If you wish to buy an Interface 1 or Wafadrive, take your Spectrum along to the shop and ask for a demonstation using your Speccy. Don't worry, if they are are not compatible — no harm will be done.

CURING UNWANTED INTERFERENCE

I use my Spectrum for odd jobs such as cash-flow, sales analysis, and suchlike. I also have a 'Freedom Phone' cordless telephone, and we find that the Spectrum interfaces with it's remote handset by giving a constant burble of background sound. Both items share a common power supply, although they are about 20m apart. Can I cure this interference?

BR Brierley, Norfolk.

The best (and cheapest) way to prevent interference is by moving the Spectrum away from the cordless 'phone, and powering it from a separate supply. A more expensive solution would be to buy a keyboard case that encloses the Spectrum. These are normally made of some type of plastic, and still need shielding. You'll find a full article on these elsewhere in this issue. Cooking foil stuck on the inside of the new keyboard enclosure will help, be careful not to cover any ventilation slots!

HUNGRY HIC-CUP

I've been trying to type-in the *Hungry Herman* game listing that was in *Sinclair Answers* No 1. All goes well until I reached line 7170, and find that the Spectrum would not accept this line. Could you please tell me as to why this is so?

Migel Ireson, Hants.

The <030> at the end of line 7170 is the checksum for that line and should *not* be typed in. Also, the keyword AT has been split to fit the page, and this may have confused you too.

POWER FAILURE

My Spectrum power supply has stopped working while my Spectrum is out of guarantee — is it possible to obtain a new one. If not, can any other 9V mains adaptor be used?

Mark Higgins, Essex.

Sinclair can supply a separate power supply on request, and so should the larger stores such as WH Smith and Boots. Otherwise, you could use a power supply of your own as long as it has the right connector and outputs voltage at 9V, 1.4 Amps.

COLOURFUL POLY-FILLER

```
  10 FOR l=1 TO 20 <067>
  20 LET x1=RND*256: LET x2=RND*256: LET x3=RND*256 <02
8>
  30 LET y1=RND*176: LET y2=RND*176: LET y3=RND*176 <16
7>
  40 INK INT (RND*8) <248>
  50 GO SUB 1000 <058>
  60 NEXT l <173>
  70 STOP  <171>
1000 REM ------------------ REM <110>
1010 REM   Triangle Filler  REM <098>
1020 REM ------------------ REM <122>
1030 IF y1>y2 THEN  LET temp=y1: LET y1=y2: LET y2=temp
 <239>
1040 IF y2>y3 THEN  LET temp=y2: LET y2=y3: LET y3=temp
 <251>
1050 IF y1>y2 THEN  LET temp=y1: LET y1=y2: LET y2=temp
 <243>
1060 PLOT x3,y3: DRAW (x2-x3),(y2-y3) <004>
1070 DRAW (x1-x2),(y1-y2): DRAW (x3-x1),(y3-y1) <063>
1080 FOR x=1 TO -1 STEP -2 <189>
1090 LET inc1=(x3-x1)/(y3-y1) <235>
1100 IF x=-1 THEN  LET x3=x1: LET y3=y1 <002>
1110 IF y3=y2 THEN  GO TO 1160 <041>
1120 LET inc2=(x3-x2)/(y3-y2) <202>
1130 LET xp1=x*(x3+(y2-y3)*inc1) <238>
1140 LET xp2=x2*x <153>
1150 FOR i=y2 TO (y3-x) STEP x: PLOT xp1,i: DRAW x*(xp2
-xp1),0: LET xp1=xp1+inc1: LET xp2=xp2+inc2: NEXT i <02
0>
1160 NEXT x <009>
1170 RETURN  <103>
```



I own both a BBC Micro and a Sinclair Spectrum. I have recently been writing simple graphics programs on the Spectrum, and found the range of commands severely limited, especially for filling areas of the screen, where I normally use the triangle-fill facility available on the BBC. Are there any packages available which would give me these facilities on the Spectrum?

G Allerton, Brighton.

There are a number of packages which allow you to draw pictures interactively on the screen, such as *Melbourne Draw* and *Screen Machine;* these are, however, designed specifically as drawing packages, rather than graphics extensions to the Spectrum Basic. It is nevertheless very easy to implement the graphics facilities available in other Basics on your Spectrum. As an example of this, the listing in *Fig. 1* gives a routine to fill triangles.

To use the routine, all you have to do is set the values (x1,y1), (x2,y2), (x3,y3) for the three points of the triangle, using Spectrum graphics coordinates, then GOSUB 1000, to draw and fill the triangle in the present INK colour. Since the Spectrum does not have pixel-definable colours, overlapping triangles of different colours can give some strange effects (see jagged blob above).

Lines 10 to 70 of the listing give a quick demonstration, plotting random triangles of different colours.

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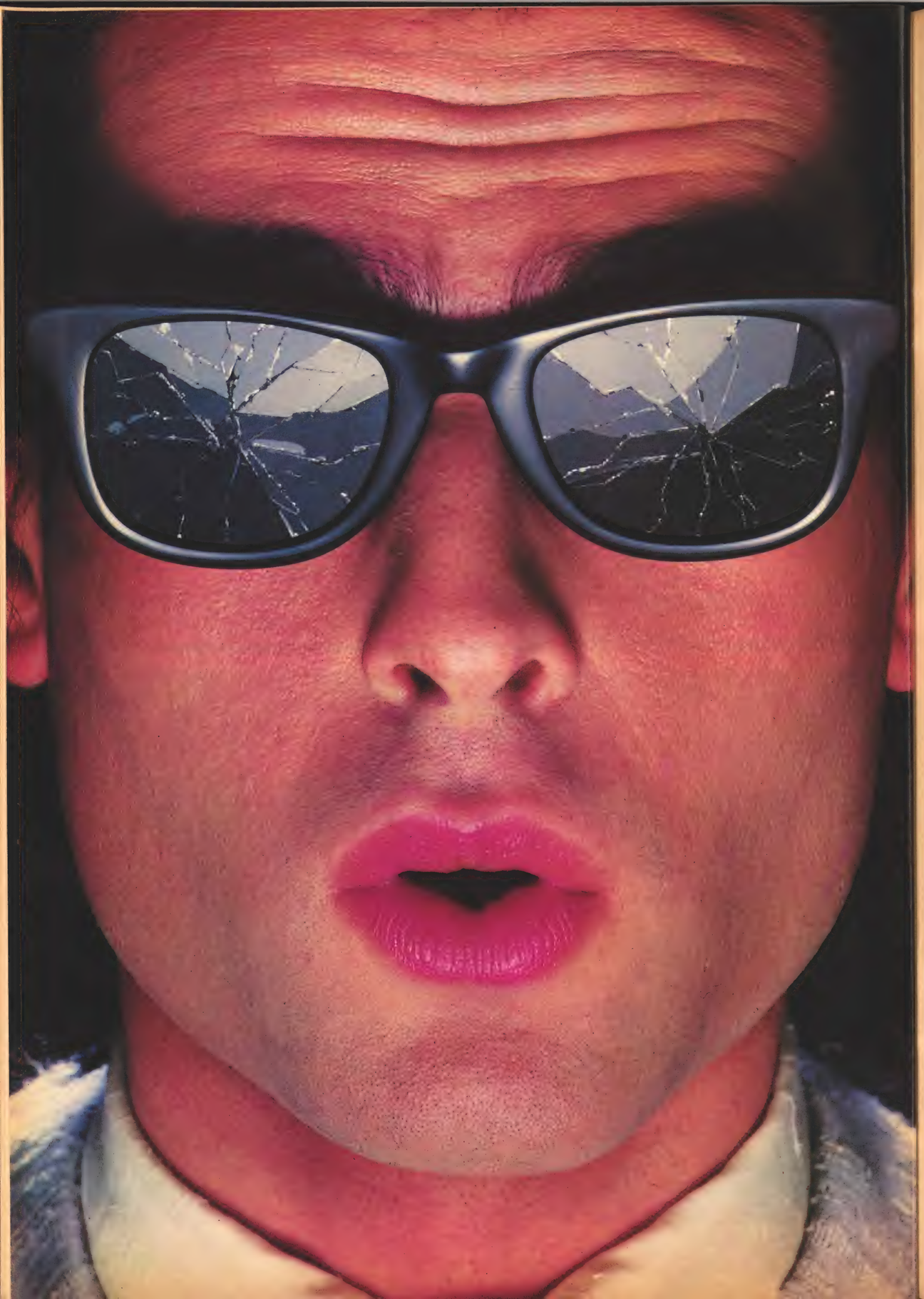
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Glasgow. Boots, Union Street and Argyle Street. Tel: 041-248 7387.

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Here's your chance to contribute to the most important event of the microcomputing calendar – The British Microcomputing Awards 1985.
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The BMA 1985 is looking for technological excellence and value for money. Who do you think deserves to win these highest of accolades? Fill in the nomination form and let us know. Your nominations will be carefully considered by a team of experts from this magazine who will then forward a shortlist to two independent panels of judges.
The winners of the eleven categories will be announced at the Awards Ceremony next June and they will each receive the unique BMA trophy. The ceremony will also make a series of special commendations for computer projects of social importance. There will be a major presentation to Concerned Micros in Education and Training (COMET), the charity established by the BMA 1984, to aid disabled young people.
Complete the nomination form opposite and you could join the top names of the industry at the prestigious Awards Ceremony in London next June

The judges will be looking for a number of important qualities in all the products nominated. These include value for money, ease of use, flexibility and innovation. Colour, sound and speed, as well as software support will be other key considerations in judging the hardware, and use of the machine in the software categories. The judges will also be looking at the consumer support service offered. There are however, certain specific requirements:

1. Business Microcomputer & Business Microcomputer of the Year. The machine must cost less than MRP £5000 including operating systems, CPU, keyboard, disks and monitor. It must be disk based, come with at least a 90-day guarantee and have a wide range of business software.

2. Business Software & Business Software of the Year. Software should be disk based with a MRP of less than £1000 per package or module.

3. Home Microcomputer & Home Microcomputer of the Year. The machine must not cost more than MRP £500

4. Home Software & Home Software of the Year. Software must not cost more than MRP £50.

RULES 1. Categories 1-5. Manufacturers may nominate their own products which need not have been made in Britain but all products must have been available for purchase from retail outlets in the UK by January 31st 1985.
2. Categories 6-9,ii. Manufacturers may nominate their own products which need not have been made in Britain, but all products must have been available for purchase from retail outlets in the UK between 1st November 1983 and January 31st 1985.
3. Employees of VNU Business Publications BV, The Organisers, The Sponsors or any individuals associated with the British Microcomputer Awards are not eligible to place a nomination with the exception of the six VNU title judging panels which may each nominate up to six entries.
4. The decision of the judges is final and no correspondence will be entered into.
5. All nominations must be received by noon February 15th 1985.

Enter your nomination for each category and explain, in not more than 30 words, the reasons for your choice, using another sheet of paper if necessary. You should consider carefully the guidelines given for each category.

Category 1: Business Microcomputer_____

Category 2: Business Software_____

Category 3: Home Microcomputer_____

Category 4: Home Software_____

Category 5: Educational Software_____

Category 6: Game of the Year_____

Category 7: Peripheral of the Year_____

Category 8: **(i)** Home Software of the Year_____

(ii) Business Software of the Year_____

Category 9: **(i)** Home Microcomputer of the Year

(ii) Business Microcomputer of the Year_____

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MICRO BRITISH COMPUTING AWARDS 1985

Send your nominations to:
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Nomination forms must reach the Awards Office by noon, Friday 15th February 1985. Nominations cannot be accepted after this date.

DIY JOYSTICKS

KEEN ON FIDDLING WITH SOLDER—AND SAVING A FEW BOB? THEN WHY NOT TRY BUILDING YOUR OWN JOYSTICK?

Back in the distant days of the ZX80, there was no great divide between Sinclair owners and hobby electronics enthusiasts; now, with the humble Spectrum Plus sporting a swish QL-style executive keyboard, the gulf appears unbridgeable. To remedy the situation, *Sinclair Answers* brings you the first of its regular build-it-yourself features, kicking-off with building joysticks.

Mass production techniques mean that low budget joysticks now cost as little as £7.80. One of the kits we built effectively cost exactly £7, so the money saved is hardly mind-boggling. However, the aim of building your own joystick is more to have a little fun than to save pennies, this article therefore panders to all closet Airfix kit addicts who've been dying for the chance to bring out the Stanley knife and tube of cement before the blade blunts and the glue dries-up for good.

There are basically two types of joystick suitable for home construction. The most common type employs a potentiometer, while the alternative method employs micro-switches. The former gave the most pleasure and was easiest to make so we would recommend it. The micro-switch joystick was only for the really dedicated. The beauty of this exercise is that the joysticks will work with all the major interfaces, such as Kempston, Protek, and Interface 2.

Voltmace is prepared to sell a potentiometer joystick in knock down form for £4.50 (inc. VAT). That price includes the potentiometer, casing, fire button and cable. The good thing about the Voltmace kit was that the instructions were short, precise and to the point. In all it took roughly half an hour to put the joystick together. One tricky part is identifying the correct terminals. Another problem we had in building the Voltmace joystick was in fitting the two halves of the casing together. The potentiometer has to be aligned just right before the two halves will meet correctly.

The terminal connections are the same for any potentiometer joystick, not solely Voltmace's; thus, the scope for the electronics hobbyist is considerably widened. Quite frankly, the cheapest and wisest route to building a Sinclair joystick appears to be thus: go out to the local electronics/radio shops and search for a cheap potentiometer; find an inexpensive fire button, and use any old box for the plastic casing.

We located a variety of potentiometers on the market. One was from Tandy at £2.99; another, for £4.25, was from Henry's Computers. Although Henry's unit cost more, we found the feel was a lot better than cheaper units (it would appear that prices are lower if you buy mail order or live in the provinces). Also a lot of time spent wandering around electronics sales and marts will pay divideneds. In the end we obtained a fire button for the princely sum of 28p, so there is plenty of hope yet.

The requisite joystick is actually fitted with two potentiometers each with three terminals. Connect the wires for Left and Right to one potentiometer and Up and Down to the other. Cross connect the centre terminals to provide the earth. Take one wire from the earth terminal to the fire button. The other wire for the fire button is provided by the connecting lead (see *Fig. 1*). If you make the wrong connections, try re-orientating the joystick in the casing.

The only thing now missing for compatibility with a Sinclair micro is the 9 way Atari style D-type socket, which allows the joystick to be plugged into all the standard Sinclair interfaces. Voltmace sells a cable with the appropriate plug moulded on for £2.50, but this effectively pushes the price up to £7. However, it could prove money well spent if our experience was anything to go by. As things turned out the socket and hood we obtained from Tandy fouled virtually every interface tested. Added to this the whole assembly cost £3.28 (£1.79 for the socket plus £1.49 for the hood) — and that's not including a cable.

Our advice would be to shop around. Eventually we found a 9 way socket in Technomatic for £1.21 (don't forget that its the female socket, not male plug, that is required). A rough guestimate of the cheapest possible socket would be around the £1 (inc. VAT) mark. Instead of buying a hood it would be quite simple to protect the soldered connections with part of a matchbox and some insulating tape.

Another way out of the plug/cable problem is to buy a joystick extension lead as sold by Tandy (£2.99 inc. VAT). This can be used either to provide a enormously long joystick cable or cut in half to give one cable for the joystick, and another cable for future use — for instance, making your own joystick interface.

The pin outs for connecting up a standard 9 way D-type Atari style joystick socket are given in *Fig. 2/3*. The important point to observe when soldering the joints is the connections are viewed from the rear. They are thus a mirror image of how the connections appear from the front. We fell into this trap initially with the result that Up became Down, and Left became Right. The numbers for the pins appears to be standard industry practice. The type of interface should make no difference to the actual pin outs as long as it has the Atari style 9 way plug.

This brings us to the micro switch type of joystick. One company, John Bull Electric, stocked a kit of parts for £2.50 (it turned out that the bits were the result of an original article in *Sinclair Projects* magazine); however, we weren't really prepared for the amount of time that had to be spent in building this kit. One good tip if you decide to undertake this project is to make sure that you read the enclosed instructions at least three times, if not more, should you hope to have more than just a surface understanding of them.

In the end we figured out a way of using the enclosed formica baseplate as the template which saved a great deal of time. It wasn't until we actually started to build the joystick that we realised the micro switches were bolted to the casing not the baseplate.

There were a number of faults with the supplied kit, too. The four bolts provided to bolt the casing together had no nuts; there were two washers supplied with seemingly no visible purpose and the major fault — despite all the talk of the need for precision — was the one vital component, a large washer, wasn't the correct size and had to be drilled out to match the joystick knob. We have yet to figure out why the kit comes with a 19 core cable, and not something far more manageable. It took a good afternoon's work to drill all the appropriate holes, and additional time to decide how to make the electrical connections.

The micro switches supplied have four terminals. Two are used to make a connection and two are used to break a connection when the button is pushed. For our purposes the pair for push-to-make are used. Using a circuit tester revealed that the outside two terminals were needed. Making the connections to the 9 way socket is straightforward: for example, one wire for the micro switch used for Left goes to pin 4 (left), while the other goes to earth (pin 8); this gives five wires that have to be connected to earth, one from each micro switch and one from the fire button.

As a means to testing the home built joysticks it was suggested we should bench test them using a common piece of software. *Daley's Decathlon* was immediately suggested, but no tests were carried out since it was blantantly obvious that the micro switch joystick would not survive, as this particular ▶

ILLUSTRATION BY TONY HANNAFORD

Technomatic,
305 Edgeware Road,
London W2.
Tel: (01) 723 0233.

Watford Electronics,
33-35 Cardiff Road,
Watford,
Herts. WD1 8ED.

J Bull (Electrical),
34-36 America Lane,
Haywards Heath,
Sussex RH1 6 3QU.
Tel: (0444) 45463.

Flight Link Control,
Unit 12,
The Maltings,
Turk Street,
Alton, Hants.
Tel: (0420) 87241.

Tandy Corporation,
Tameway Tower,
Bridge Street,
Walsall,
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Tel: (0922) 648181.

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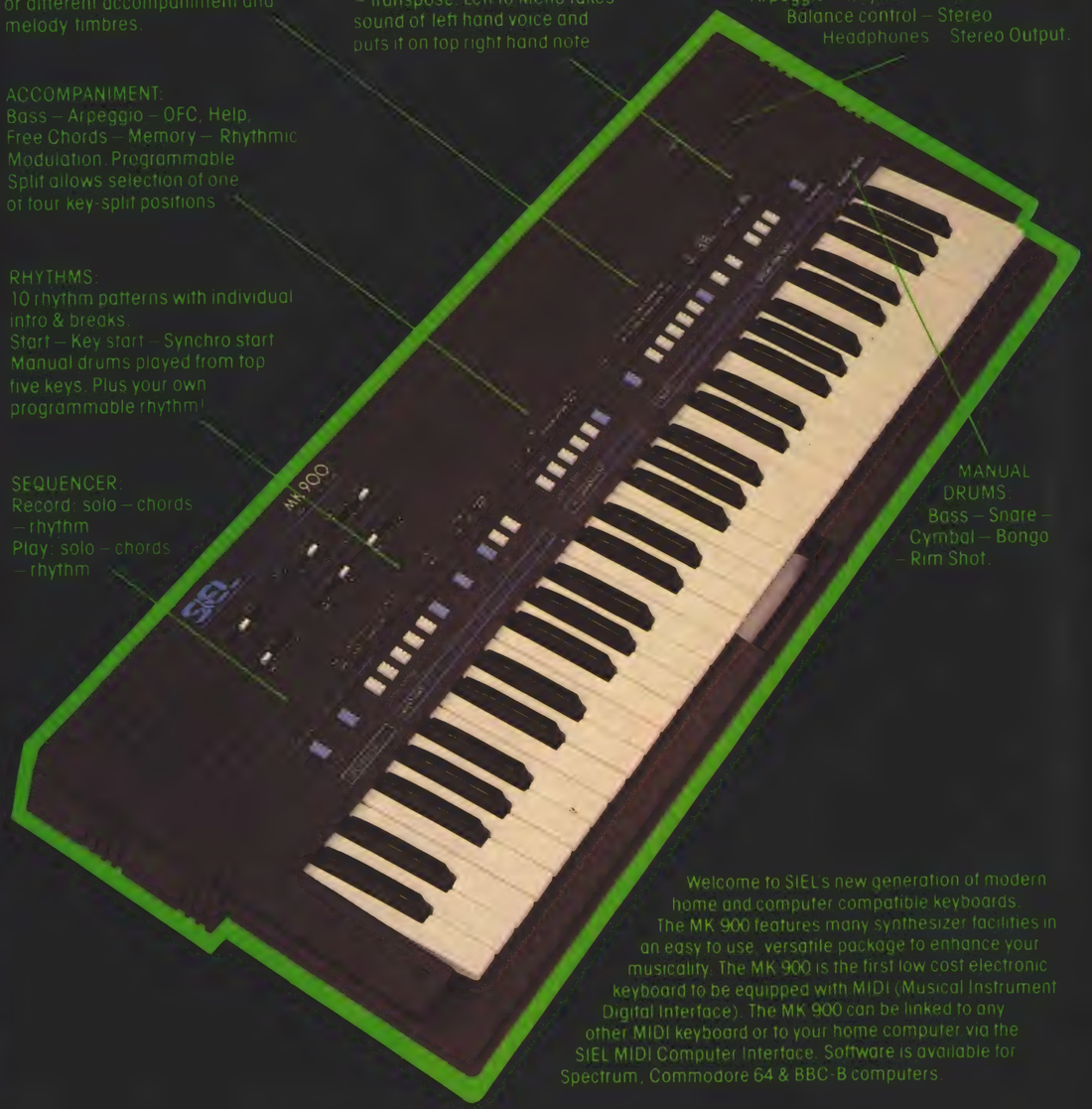
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FIG.1

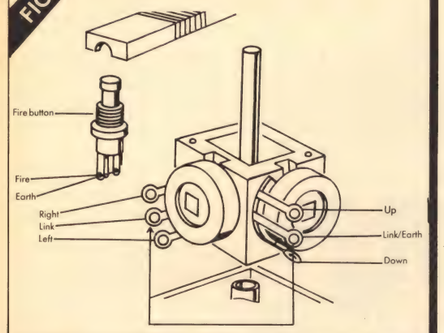


FIG.2

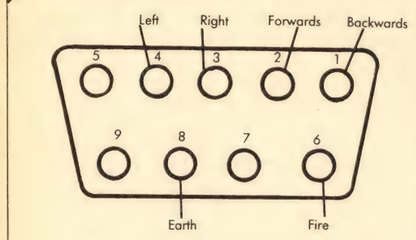


FIG.3

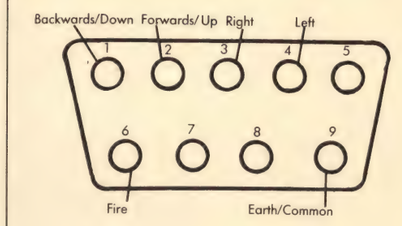


Fig. 1 shows the basic joystick pontentiometer connections; Fig.'s 2 and 3 show the pin outs for connecting up a standard 9 way D-type Atari style joystick — Fig. 2 shows the front, and Fig. 3 the rear.

game requires vigorous joystick jerking to effect action on screen. However, we did try the joysticks with a number of different popular interfaces (including Interface 2 from Sinclair) with no real problems. If the plug could be physically inserted into the interface it would work.

The outcome of this article was a large number of skeleton joysticks and considerable amusement from our efforts to get them working. We'd recommend building a joystick to anyone who's got a soldering iron and a few hours to spend. If the idea of building a batch of joysticks to sell to your friends appeals, then a company called Flight Link will sell casings and joysticks for orders of 10 and more.

Next issue we intend to take on something more ambitious — the joystick interface itself. So stay glued.

By Tony Dennis, deputy editor.

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Park Drive,
Baldock,
Herts. SG7 6EW.
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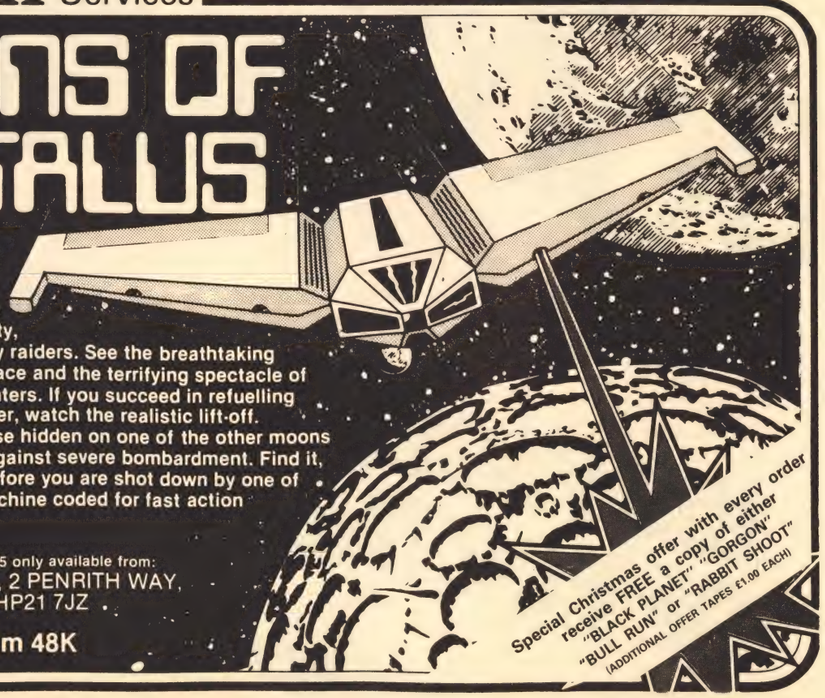
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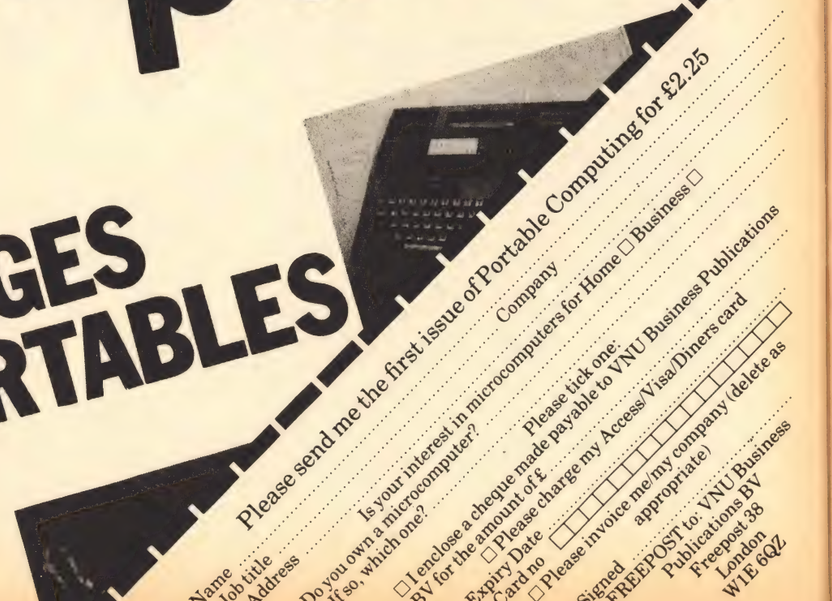
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LEARNING THE BASIC

WE LOOK AT TWO TUTOR PACKAGES WHICH AIM TO MAKE YOU FLUENT IN THE BASIC LANGUAGE.

Until you've mastered at least Basic, your Spectrum will be your master, not your slave. We tried two Basic tutorial packages, *Learn Basic Programming* (from Logic 3) and the *Complete Spectrum Basic Course* (from Melbourne House), to see how much of a grasp of Basic they would help the novice to attain.

Logic 3's *Learn Basic* tutorial is designed for people with little or no background in computing, who possibly have a Spectrum on which to play games, but would like to learn to write their own programs. The tutorial comprises a step-by-step text covering: installation of the Spectrum, basic commands, editing and saving programs, program tracing to aid debugging, the extended keyboard, graphics and sound facilities, and finally using the Spectrum to write simple games. An additional chapter on algebraic and trigonometric functions is included in the appendix for those interested in using the computer for more sombre purposes.

The text is accompanied by two program tapes containing quizzes to test and consolidate what the tutee has learnt from each section of the tutorial, along with some example programs. The tutorial starts with a practical hands on approach, instructing the student to type in given statements and to observe the outcome.

Unfortunately, we found that the introductory chapter was at times ambiguous or incomplete, so that the novice could quite easily have made errors of interpretation, and this, together with the fact that guidelines on how to get out of difficult situations seemed to come several pages after they had been encountered, meant that the novice could find his or her initial attempts at using the Spectrum frustrating, undermining confidence.

A little more explanation on some principles, such as the structure of statements, could have proved helpful and even invaluable in the introduction, and some guidelines on what to do if things go wrong would have been appreciated, preferably before the exercises!

The remainder of the tutorial, however, adopted a more conceptual approach. The sequence of flow from topic to topic was well thought-out, so that the 'need' for a certain command or facility was demonstrated before the command was introduced. The examples used to illustrate the commands were well chosen, and highlighted the particular advantages of each command over other methods of overcoming the same programming problem. The emphasis in the choice of topics and the depth to which each is taken would be especially useful for a person interested in writing simple games.

The *Learn Basic* course does not cover use of arrays, string-handling functions and subroutines, which are essential to those intending to use the language for writing software for small businesses or for all but the simplest games. As an introduction to the language, the tutorial is well written and interesting; with logical continuity, good layout and clear diagrams, helping to give the learner a good conceptual grasp of Spectrum Basic.

The *Complete Spectrum Basic Course* claims to be suitable for beginners in computing between the ages of 8 and 65. This course covers all the topics listed for *Logic3*, with the exception of installation of the Spectrum, loading and saving programs, and using the Spectrum to write simple games. In addition to these topics, arrays, string-handling functions, and the use of subroutines are covered. The course covers more ground than *Logic3*, and pays greater attention to details sometimes overlooked by the latter. More time is spent covering some of the problems that may be encountered when using the language, and ways in which these may be overcome.

The course is divided into two sections: the first is the main body of the tutorial for the 'Learner/student', and the second is a guide for the 'parent/teacher', containing a few guidelines along with the answers to the exercises given in the first section.

The tutorial covers each subject, item by item, with each small piece of explanatory text being followed by several exercises, many of which do not involve the use of the computer, only requiring written answers. We found the exercises too frequently interspersed in the text, with the result that the course lost its flow.

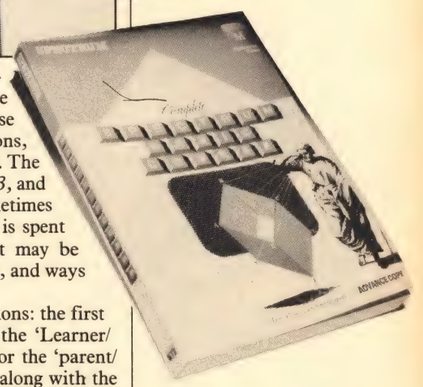
Further, the questions are low-key and repetitive, with two or three questions often being used where one would have been sufficient. We reckoned that, had the learner finally mastered the art of printing 'Pleased to meet you/I hope you are well', they might also have grasped the method with enough expertise to be able to print 'I hope it has stopped raining/We can then go out to play', their name and address.

In general, the approach is a little dry and matter-of-fact, leaving the student familar with the language, but without the inspiration to use it. The level of English, and the simplistic examples of the type illustrated above, suggest that the age-range should be trimmed to exclude older children and adults — yet the liveliness that would appeal to the very young is missing.

Both tutorials could have been improved by adopting a more structured and less linear learning path, so that the students could proceed at their own speed; otherwise, well worth considering.

By Nadia Amine, a programmer/analyst.





Left: Logic 3's 'Learn Basic' takes a conception approach, whereas 'Basic Course' from Melbourne House, covers more ground but is lacking in inspiration.

Learn Basic Programming (priced £14.95) is available from:
Logic 3,
Unit 18,
Wye Industrial Estate,
London Road,
High Wycombe,
Buckinghamshire.
Complete Spectrum Basic Course, (priced £9.95) is available from:
Melbourne House
Castle Yard House
Castle Yard
Richmond TW10 6TF.

WORKING WITH WORDS

WE LOOK AT A RANGE OF PACKAGES WHICH AIM TO MAKE YOUR SPECTRUM INTO A WORD-PROCESSING MACHINE.

Word-processing is probably the first 'serious' application that a Spectrum owner is likely to consider. Although the shortcomings of the machine (such as its cramped, 'dead flesh' keyboard) might appear to present more disadvantages than benefits, with the addition of an add-on keyboard (see elsewhere in this issue), the Spectrum can be put to farily good use in, say, small business applications, letter writing, and so on.

There are a number of WP packages available for the Spectrum, each offering different facilities at varying prices. We've taken four which seemed to be typical of features and prices, ranging from £5.95 up to £13.90; but before getting onto the programs themselves, a quick look at what a WP might be expected to do, and at some of the terminology connected with it, might be in order.

The function of a word-processor is to display whatever text is typed in at the keyboard (or loaded from storage) and, via keyboard controls, modify (edit) and format the displayed text as required. One important consideration when evaluating any WP is the functioning of the editor — how easy is it to scan through the text? Does the package have a 'find string' command? Is it possible to insert or delete a word from the middle of a line without destroying the format of the text? We will cover these points, and more, with reference to the particular packages available.

As with all areas of computing, word-processors have their own jargon. Two of the more important terms which you are likely to come across are 'wraparound' and 'justification'. Wraparound (or wordwrap) refers to a common feature found on the majority of word-processors: if a word is at the end of a line of input, but is too long to fit on the current line, the whole is automatically moved to the next line. This is very useful when typing in documents, since it is not necessary to include any carriage returns.

Justification is a function which will insert spaces between words such that all lines finish in the same character position, giving a neat, professional appearance to the finished text.

Quicksilva's *Word-Processor*, is aimed at the budget end of the market, retailing at £5.95. On loading, the user is presented with a menu offering the choices available, all the print being in normal white on black. A user manual is not provided (presumably to keep costs as low as possible), so you must first select the 'HELP' option to display the instructions. Having bought a word-processor, you presumably have a printer, and it is worthwhile to commit these three pages of instructions to hard-copy, providing a quick reference guide.

On selection of 'EDIT', a blank screen is displayed, but for the bottom line which informs the user which lines the cursor and 'marker' are on. The marker is simply a special cursor, used for some of the editing functions. Typing text is fairly slow. Up to 31 characters can be typed on a single line, and continuing a word into the 32nd position causes the whole word to appear on the next line (wraparound). The process of word wraparound is again slow, taking about a second, and if you merely continue typing, it is liable to loose some letters. In addition to wordwrap, the text is automatically justified right, though any other formatting has to be specified.

There are a variety of editor commands available. Unfortunately, they are difficult to use, and the



explanation (given in the HELP pages) is rather confusing. In order to use any of the editor commands, both CAPS SHIFT and SYMBOL SHIFT must be pressed to produce a '■' symbol, followed by any capital letter, and then ENTER. The instructions state that all commands should be entered at the start of a new line, though in fact this is only true for the two commands ■Gx (move cursor to line x), and ■Mx (move marker to line x). If you enter these on a non-blank line, you are presented with a flashing (and mis-spelt) message 'ILLEAGAL COMMAND'.

Other facilities include block delete (delete all text between the marker and the cursor), line delete, line insert, character delete and insert, and the usual cursor movement.

A couple of problems we found when using this package was that the last line sometimes disappeared when inserting a new one; also if an existing line is modified, then it is no longer right-justified, so you'll have to reformat it.

Despite these criticisms, this package is reasonable value for money and provides the essential elements of a word-processor; however, it cannot be recommended for the more serious user.

At £9.95, the Microl *Word-Processor* costs a little more than Quicksilva's offering. The cassette comes complete with a well-written and easily understandable user manual, which contains a number of useful examples (particularly on formatting finished text). Apart from the top of the screen, which is used to display the current mode ('EDIT' or 'TYPE'), the screen is printed in black ink on a white background. Keyboard response when typing is quite fast, and a beep as each key is pressed has been implemented to aid typing.

Once the text has been inserted, paying no attention to formatting, edit mode is entered to correct typing errors and make any other modifications. We found the editor easy to use, but lacking in flexibility. Being a line editor, the cursor can only move from one line to another, and not within a particular line. Having found the line to be modified, the 'replace string' function must be used. The incorrect string is typed, and the program searches for its first occurrence before requesting a replacement string.

Other implemented functions include block delete, block copy, find string, retrieve the last line deleted, and a very useful instruction called 'AGAIN',



which repeats the last find or replace, starting from the current cursor position.

Formatting finished text can be achieved by commands embedded in the text itself, which apply to the text immediately after the command. These commands begin with a full-stop and occupy their own lines, making them easily distinguishable from the text itself. At any time, you may preview the formatted text on the screen. At this point, a menu is displayed offering additional format specifications, such as page length, line length and margin settings. Having satisfied yourself that the format is correct, it can be sent to the printer.

One final additional feature available is 'MAIL-MERGE', which allows you to create a skeleton document (for example, a letter) containing invariant text, and insert variable names (for such items as name, address and date). Upon printing, the program prompts the user to enter a value for each of the variables, which are then inserted into the correct places.

Though easy to understand, the Microl *Word-Processor* suffers from the serious drawback of only offering line editing. If the user is willing to accept this limitation, then this is certainly a package worth considering.

The *Spectext* word-processor (from McGraw-Hill) is supplied with a file storage (database) package and a linking program, for £13.95. Again, there is no user manual, but instead the instructions are supplied in two files on the tape, which must be accessed via the word-processor and printed.

Text is entered in the normal way with word wraparound. Pressing ENTER causes a prompt to appear asking the user to specify either forced new line, new paragraph or new page, at which point an appropriate graphics character is inserted. In edit mode, the features available include block delete, insert search and replace string, block move, print, load and save text. Cursor movement is done using the standard cursor keys, and two additional keys are included to jump forwards or backwards by a page.

The formatted text can again be viewed on the screen before printing, but as in the Microl package, this is for display purposes only and cannot be edited. Formatting options available are adequate for most purposes, including line length, page length and margins.

One further point worth mentioning is that *Spectext* is Microdrive compatible, so you can store your files on cartridge in a fraction of the time required for tapes.

Our main criticism of *Spectext* is that the unformatted file appears as a solid chunk of text, making reading very difficult and requiring frequent glances at the 'preview' section, however, this is a minor complaint, and though expensive, *Spectext* is supplied with a file management system, making it good value for money.

Tasword Two is the most flexible of the four packages we looked at, retailing at £13.90. It comes complete with a comprehensive user manual and the cassette-based Tasword Tutor. When accessed by the word-processor, this leads the user through the available features, explaining each in turn, then prompting the user for their use. We found this to be an extremely useful course of instruction and, having completed it, were fully aquainted with the capabilities of *Tasword Two*.

The facilities provided were very impressive. The text can be printed either as 32 or 64 characters per line; though obviously smaller, the 64 column mode was still readable, and can be printed, though not as double height characters. The full range of search, add, delete, block move and delete facilities are provided, together with some additional features: for example, the INVERSE VIDEO and TRUE VIDEO keys are used for cursor movement to the next or previous word, allowing fairly rapid movement through the text. The file can also be scrolled either by line or by screen page.

Formatting is performed as you type, thus it is possible to view and immediately edit what will actually appear on the printer. Various commands are provided to aid this formatting, such as a function for centering the current line between the left and right margins. Justification and word wraparound can be selected or deselected as desired.

A wealth of additional information further enhances the versatility of this package: for example, Spectrum graphics may be used, characters redefined for printers other than the ZX printer, and printer control characters may be defined allowing, for example, emphasised print to be used on Epsons.

Tasword Two, which is also available as a Microdrive cartridge, is to be highly recommended as the best of the word-processors reviewed, and the only one really suited for the serious user.

By Jack Pundick, a computer consultant.

Opposite page: Quicksilva's word-processing is aimed at the budget end of the market; (below left:) Microl's word-processor suffers from only offering line editing; (below right): Spectext is Microdrive compatible; (below): Tasword — flexible and comprehensive.



Word Processor (priced £5.95) is available from:
Quicksilva,
Palmerston Park House,
13 Palmerston Road,
Southampton SO1 1LL.
Tel: (0703) 20169.
The Word Processor (priced £9.95) is available from:
Microl,
1 Milton Road,
Cambridge CB4 1UY.
Tel: (0223) 312453.
Spectext (priced £13.95) is available from:
McGraw-Hill,
Shoppenhangers Road,
Maidenhead,
Berks. SL6 2QL.
Tel: (0628) 23432.
Tasword Two (priced £13.90) is available from:
Tasman Software,
17 Hartley Crescent,
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C.0417 £24.95

Database: The Gemini Database Management System is a program designed to enable the user to store all types of information in similar format to a card indexing system. The program will ask you for the headings under which you wish to store the information on a 'card', i.e. for a record collection database these might be 'Artist', 'Song', 'Composer', etc., or for example in a database set up for a deep freezer, 'Use by date', 'Value', 'Type of food', 'Shelf', etc.

Having set up your fields, you may then add, delete or change information on the 'cards' under the headings you have elected. Gemini databases contain other important and useful utilities as well, e.g. alphabetical and numerical sorting, numeric calculations, finding records that meet specific requirements, line printer routines, browsing facilities, etc. For example a list of all recordings by a particular composer, calculate total value of freezer contents, etc.

Mailist: Gemini's Mailist program will enable you to keep a record of names and addresses and then print, examine, sort and find them, all with special selection techniques, containing our exclusive 'SEARCHKEY' system, giving you the option of creating your own dedicated coding system for each name on file. For example, on most mailing list systems, you are only given the standard heading such as name, street, town, country, postcode etc. With the Gemini searchkey system, you could find, say, all names on the file that are companies having a turnover in excess of '50,000' or all names that are subscribers who are behind in their subscriptions or all names that are eligible for a Christmas card this year!

A full and useful range of routines is included in the menu, and the program allows you to set up your own format for printing labels, i.e. the tab settings you require and spaces between labels, etc. Multiple copies can also be printed.

Graph Plot: Provides an easily assimilated visual representation of numerical data.

For example monthly sales statistics comparing two year's results may be instantly converted into two side by side pie charts, histograms or graphs... for easier visual comparison and assimilation.

It is particularly recommended where any kind of mathematical plotting facility is required.

"Independent Press Comments"

"Remarkable software, friendly and well designed, a pleasure to use."
— Gemini Cash Book, The Scotsman 12/8/83

"Will enable business people with a moderate grasp of accounting principles to produce a set of figures that will satisfy both the bank manager and the Tax man."
— Gemini Cash Book, Micro User, August 1983

Home Accounts: Designed as a complete Home Accounting package, this program allows the user to set up a budget for items of household expenditure and compare actual expenditure with budget. A running total of all surpluses and deficits is available both as digits, and in the form of a bar chart.

A complete Bank account routine is included, together with suggested expenditure categories such as mortgage, rent, rates, telephone, gas, electricity, etc. However, these may be deleted or augmented without difficulty.

Available from:

Larger branches of Boots and W.H.Smith and most good software dealers... or phone Gemini for prompt despatch quoting your Access, Visa, or American Express card number. Telephone (0395) 265165. Alternatively make your cheque or Postal Order payable to Gemini Marketing Ltd., amd send to Gemini Marketing Ltd., 18a Littleham Road, Exmouth, Devon EX8 2QG.

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QL ADD-ONS COME OF AGE

WE TRY A NEW RANGE OF PERIPHERALS FOR THE QL.



The potential of the Sinclair QL took a considerable 'quantum leap' with the announcement of much needed floppy disk drives. These will not come from Sinclair though, but from an independent company called Quest. In addition to the floppy drives, hard disks, memory expansion modules, a large console and CP/M were also planned — all in all, an impressive range of products for the much-maligned QL.

It is important to point out that we have not had any of these products in for a 'hands-on' review, so we can only give you our first impression, and hope to bring much more comprehensive coverage in our next issue.

For most prospective QL buyers (and the few QL owners), the most important of these new products is probably the floppy disks. These are based on drives from Shugart, which we know to be quite reliable and robust. The storage capacity of the range starts at 200K, and goes up to dual 800K drives. Although the prices include a controller, power supply and cables, they do not include VAT, so for the home user will be a bit expensive. The best value would appear to be offered by the dual 400K or dual 800K drives.

CP/M for the floppy systems will cost you £49.50 (exc. VAT), but what is quite interesting is that CP/M is available for the Microdrive (at the higher price of £79.95). Some business software was also announced (Sales Ledger, Invoicing, Stock Control, and so on), which, we are told, integrate with each other and also with Psions' four packages (*Quill, Easel, Archive* and *Abacus*).

Psion have updated their software to improve on the versions initially bundled in with the QL. These packages will have to be altered by Psion to work on the floppy or hard disks, although David Potter (Psion's MD) says that this will be quite straightforward with the second versions of his company's programs. But the point is, don't buy the Quest disks and expect to be able to run the bundled software with them — they won't!

The two other main products from Quest are memory expansion boards and a large console. The console is very solidly made, and dwarfts the QL! The prices and capacities of the expansion memory are shown right; to this the cost of an extra power supply is probably necessary (and is recommended) for all but the 64K RAM card. The console is available in two forms, either as simply a monitor stand, or as an expansion unit that can take up to four expansion cards and the additional power supply.

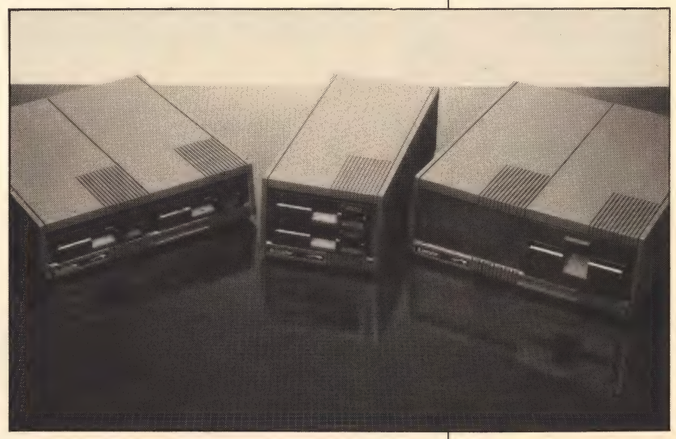
Quest describe the QL as a 'typical Sinclair product', that is, a machine that has nothing in it that is not absolutely essential to keep costs down. But this has meant a considerable effort has been necessary by Quest's engineers to get round some of the problems this imposes (missing electrical signals, and the like), however, there can be no real doubt that the addition of these new products will add significantly to the saleability of the QL.

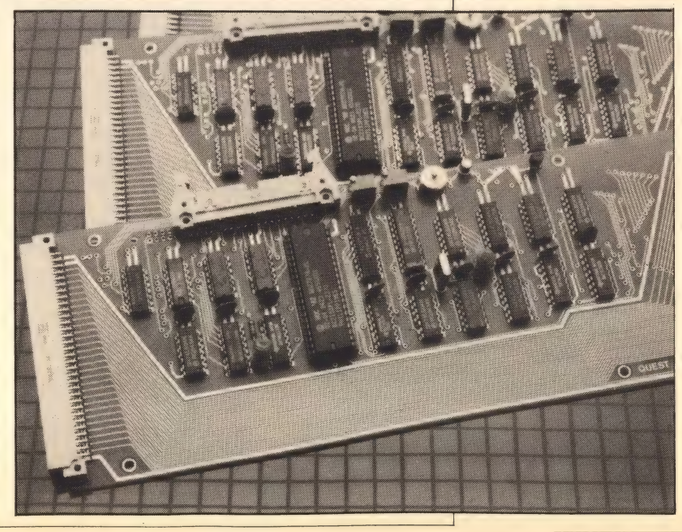
By Peter Turcan, editor.

Left: Quest's QL expansion console; below: the Executive range of floppy and hard disk drives; bottom: Executive floppy disk controllers.

QL Executive Series (all prices excluding VAT): 64K RAM (priced £99); 128K RAM (priced £159); 256K RAM (priced £299); 512K RAM (priced £499); 200K Floppy (priced £249); 400K Floppy (priced £359); 800K Floppy (priced £425); 2 × 400K Floppy (priced £499); 2 × 800K Floppy (priced £599); 7.5MB Winchester (priced £995); Storage Box/Hand rest (priced £49.50); Expansion Box (priced £109).

Quest,
School Lane,
Chandlers Ford,
Hampshire SO5 3YY.
Tel: (04215) 66321.





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■ Advanced Memory Systems have established an excellent reputation for product reliability and prompt delivery. This product has been tested to an impressive 20,000,000 depressions per key and AMS offer a full one year guarantee.

LO>>PROFILE

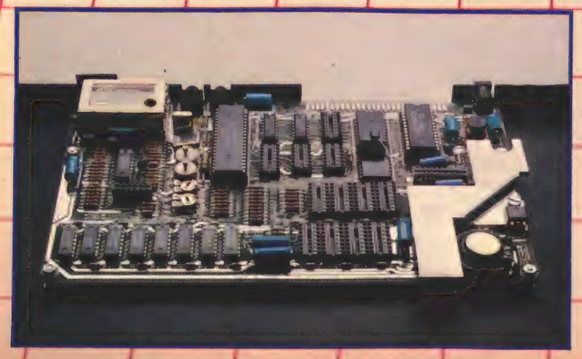


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Fitting your Spectrum computer board into the **LO>>PROFILE** keyboard is easy. All you need is a screwdriver to secure the board onto the base of the keyboard enclosure using the mountings provided. The **LO>>PROFILE** is compatable with all Spectrum add-ons.

If not available from one of our 200+ dealers then fill in the coupon and we will send you a **LO>>PROFILE** with our full no-quibble money-back guarantee. Or phone 0925 602690/ 62907 for instant Access or Visa orders.



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Signature _____ Date _____
Name _____
Address _____
_____ Postcode _____
To: Advanced Memory Systems Ltd.,
Woodside Technology Centre,
Green Lane, Appleton, Warrington WA4 5NG

PROJECTING YOUR BUSINESS

PROJECTOR 1 OFFERS SMALL BUSINESSES PROFESSIONAL GRAPHICS PRESENTATION.

The Spectrum may not at first glance seem suitable as a business machine, but with appropriate software it can prove surprisingly useful in small-scale business applications. *Projector 1* (from McGraw-Hill) is a business graphics, forecasting and presentation package, which does turn the 48K Spectrum into a worthy, a small-business tool.

Projector 1 is supplied in a silver case which contains the program cassette, a 16 page instruction booklet, and a help card. Included in the price (£13.95) is a demonstration package which illustrates the main features available.

The instruction booklet is well set out, and covers every aspect of the program including error messages and what to do should they occur. Any problems you encounter are catered for in the form of the help card: this is to be returned to the publisher with your problems, which they will hopefully solve.

Each time you load *Projector 1*, you are presented with a menu for selecting a printer interface. Options include Kempston, Alphacom and Sinclair. The software included will drive the Epson MX100 series; other types of printers are viable with an option to load your own driver software.

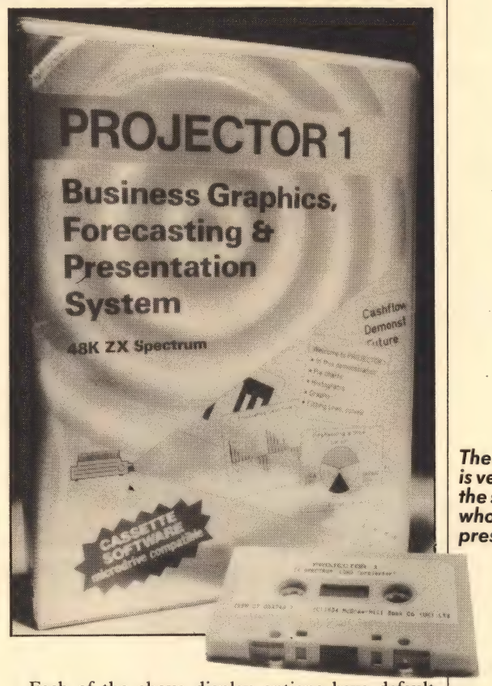
Once you have selected your printer, you restart the tape and load the main body of the program which takes around five minutes. From here on in everything is menu driven. Selection of any option requires the cursor to be moved to the relevant place and then pressing enter; one of these option is the directory, a list of all data held in memory and available memory for new data, and space available for new data.

Data entry is simple and must be in one of five formats: DAYS, WEEKS, MONTHS, QUARTERS or YEAR. It can be positive or negative integers or floating points; pairs of values can also be entered to produce an x-y graph. Up to 63 numbers can be entered as ordinary data, or 42 numbers as pairs. Data in memory can be easily modified using the simple editor functions: insert blank line, delete line and copy line. Data can be saved to tape or Microdrive for later use.

Once all data has been entered you have to decide in which format you wish to display it. A good choice is available — histograms, pie charts or graphs. Graphs are produced on an x – y axis, which are labelled and sealed automatically. The display can be improved by joining up the points to produce a line graphc or a background grid. Fitted curve or fitted line tries to join up the point and produce the best fit. Graph statistics are also available.

Projections can be made from the data on the graph and the future values plotted is made. Unfortunately these predictions cannot be saved for use in a presentation. Pie charts can be displayed whole or with one or all segments highlighted as slices. Each segment is shaded differently so that when copied to a printer it is differentiated.

Text may be added to form a description of the chart. The arrow keys are used to move the cursor around the screen, and any text entered is dated by overstriking with a space. On screen, the colours can be changed to suit the user.



The Projector 1 package is versatile and useful for the small businessman who requires effective presentation.

Each of the above display options have default values for x and y axis, and suchlike, and can be over-ridden by the user — but the computer will not allow ridiculous values. On completion of each display you can return to default option menu by (SYMBOL-SHIFT) R, copy the screen to your printer, or quit to the main menu. Each display is given a unique reference: for example, P1 for pie chart.

Once you have finished compiling your displays, a presentation can be built. A presentation consists of a series of displays strung together to produce a slide show effect. To highlight your presentation GRAPHIC IMAGE enables you to load a title page which you have previously designed and saved with SCREENS. Because a screen uses up nearly 7K of memory, there is room for only one title page. Key points enable you to narrate your presentation with screens of different coloured text. Up to six lines of 21 characters are allowed on each key point, and the characters in each key point are triple normal height and in most cases single width. Upper and lower case characters (with real descenders) are allowed, together with numbers and a few special characters. Once built presentation can be sent to run normally or automatically with a predetermined delay.

Projector 1 is a versatile and useful package ideal for the small businessman who requires a professional tool to produce a very effective presentation. It is uncomplicated to use, and the speed of response is comparable to that of the packages available for the more expensive end of the market.

By Steve Perkins, a computer programmer.

Projector 1 (priced £13.95) is available from:
McGraw-Hill,
Shoppenhangers Road,
Maidenhead, Berks
SL6 2QL.

RIGHT TO SING THE BLUES?

I feel compelled to write to you about your article in *Sinclair Answers* No 1 called 'Banish the Keyboard Blues'. With great excitement, I bought your magazine, got home, sat down and started typing in the Checksum listing. When I finished, I saved it, then typed RAND USER 64000 to renumber the monitor program — and the computer crashed!

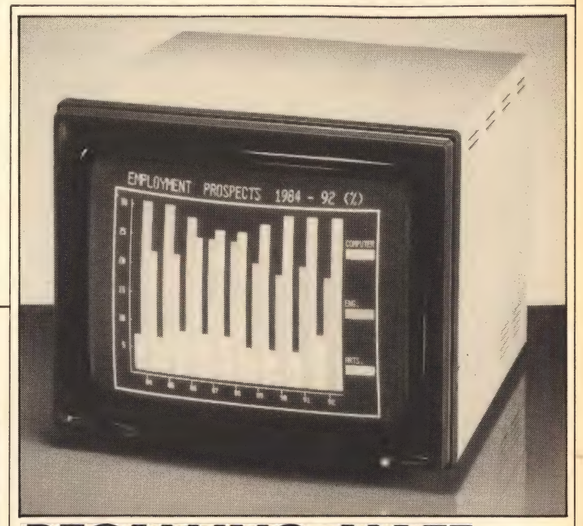
After a while I noticed that 7C9C the start of the 48K machine code listing, was a smaller hexidecimal number than FAOO the 16K machine code start. Somewhere along the line your 16K and 48K figures had got mixed up. It would be nice to see an apology for the mistake you made, and tell the readers which code is for 16K and which is for the 48K.

D Jakeman, Hull.

Something always seems to go wrong in the first issue of a magazine. Try as we might, the stubborn error gets through. As you quite rightly point out, the 16K and 48K listings were transposed in the Checksum article in Sinclair Answers *No 1. Humble apologies to you and anybody else who typed in one of the listings, only to find it didn't work.*

However, if you did manage to type the program in correctly, then all should go well. You should have both a checksumming program and an auto-numbering/renumber utility. You will see that most of the listings in this issue include checksum values.

It is probably worth pointing out a limitation (not a bug!) of this, and any other, renumber utility for the Spectrum: it is not possible to confidently renumber a program which has a line such as: GOSUB 100+X *or* GOTO 100+X. *This is because the utility cannot work out the various values of X, and even if it could it would need to alter the program more substantially than just changing numbers.*



QL CP/M HERE



I'm very interested in using CP/M on my recently acquired Sinclair QL, particularly the CP/M 80 format. Is there any software around to enable me to do this?

M Shipford, W Yorkshire.

A company called PCML have recently announced a range of extension products for the QL, and among these is CP/M 80, in the form of a plug-in RAM cartridge containing a full Z80 4MHz CPU with 64K of dynamic RAM. Although we have not yet had an opportunity to try these out, we do know that this card incorporates two intelligent 8-bit parallel ports, allowing the connection of many peripherals (subject, of course, to interfacing software).

PCML plan to market the product with a parallel printer interface which carries a 64K spooling facility and a trackerball interface. QL CP/M 80 should be available from the New Year, and priced around £299.

We suggest you contact PCML after Christmas for more details.

PCML,
Royal Mills,
Esher, Surrey KT10 8AS.
Tel: (0372) 67282/68631.

RECALLING NAFF CUB MONITORS

Calling all CUB QL-compatible users: A supplier's component fault is suspected on model numbers 1451/DQ/3 and 1451/MQ/3 with serial numbers between 85692 and 103317.

To enable us to rectify the situation, we ask *Sinclair Answers* readers with such models to telephone David Kaye on (0274) 726500, so that we can make arrangements for the collection of their monitors for the necessary up-grading to be carried out.

The cost of this operation will be borne by Microvitec PLC.

Tony Fall,
Marketing Manager, Microvitec.

JOYSTICKS COME HOME

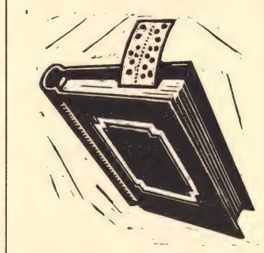
We are anxious that some early customers who purchased Protocol 4 joystick interfaces may have sub-specification production units.

The problem with these units is that they have an erratic or unreliable Kempston operation mode, and the way to check this would be to type in the following program line with the Protocol 4 attached to the Spectrum, its mode switch in the down position and with the 'Kempston' card inserted. Print IN 31, press ENTER and if anything other than 0 is printed, the unit should be returned to AGF for a free replacement, at the following address: AGF Hardware, Freepost, Bognor Regis, West Sussex, PO22 9BY.

A G Fosberry, AGF.

ADD-ON ERRATA

Apologies to Stack Computers, of 290-298 Deerby Road, Bootle, Liverpool. In our 'Century of Expansion' table of add-ons in the first issue of *Sinclair Answers*, the comment on the Trojan light pen (which we didn't like) got inadvertantly lifted up and added to the comment on the Stack Light Rifle. Our only comment on the Light Rifle was that there are several compatible games available; the 'difficult to use and inaccurate' comment refers to the very inferior Trojan light pen. We are sorry about this mistake.



THREE TESTAMENTS TO THE MICRODRIVES COMPARED, PLUS A BOOK ON EDUCATIONAL GAMES FOR THE SPECTRUM.



***Spectrum Microdrive*, by Dr Ian Logan; *Making the Most of Your ZX Microdrive; An Expert Guide to the Spectrum*, by Mike James.**

If any Spectrum add-on is worth its salt, it isn't long before there are one or two books about it on the shelves. The three books reviewed here are either totally or partially concerned with the Spectrum and the use of its Microdrives.

The first is *Spectrum Microdrive* by Ian Logan. This is written in an extreme note form, but, as you would expect from this author, is packed with detail. This detail must be pieced together by the reader, or rather user, since the book should not be read cover-to-cover, but dipped into for reference.

As any keen Spectrum user knows, the Microdrive system consists of the ZX Interface 1 as well as the Microdrive unit itself. The Interface 1 also adds the hardware and software necessary to support a standard RS232 serial interface and a local area network link.

The book's first two chapters are concerned with the extended system and extended Basic that result from fitting the Interface-1. By 'extended system', the author means the extra connections made possible by the Interface, and the second or 'shadow' ROM. The shadow ROM is built into the Interface and provides the software to support the use of these connections.

The software in the shadow ROM extends the Basic syntax checker to allow for 'new' commands, and provides the input and output routines for the Microdrive, RS232, and local area network links.

The chapter three covers the use of the Microdrive itself, and all those technical details that it is felt will not compromise the 'security' of the Microdrive. As said already, the book does not discuss applications, rather it concentrates on low-level details of usage. Chapter four then discusses the local area network in a similar fashion.

The chapter on the RS232 link includes a discussion of how another computer (in this case an Acorn BBC Micro) could be linked to a Spectrum system. Finally, for machine-code buffs we have chapter six, where the author covers 'hook codes' and the addition of new statements to the Spectrum Basic. 'Hook codes' enable a machine-code programmer to use routines from the shadow ROM, and the routines available are discussed.

The same mechanism that enables that extension can be used by the machine-code programmer to build his own Basic extensions, and several possibilities are suggested. All in all, *Spectrum Microdrive* is a precise and informative book, and a handy reference sources for a Microdrive Owner.

Make the Most of Your ZX Microdrive by Ian Sinclair, takes a completely different approach. In the preface the author, who has written a large number of books for the beginner, stresses that the book is not aimed at the expert so you will not find here the details of Microdrive operation or machin-code programming that appear in the first book.

As said, the emphasis of the second book is on the facilities afforded by Interface 1. In particular, it considers the use of the Microdrive for data storage and the connection of printers through the RS232 link.

Networking is not covered at all, a reflection of the limited use the author sees for that outside of clubs and schools.

The book opens with an overview of the Microdrives and the Interface and the question: why use Microdrives? The author, having answered this question to his satisfaction, then proceeds to discuss the care of cartridges and standard back-up procedures in the next two chapters.

These chapters cover such a miscellany of points, with a liberal helping of horse sense and experience, that it would be easy to miss the significance of the section on streams and channels. Fortunately, the whole book is written in such a way that it can be read cover-to-cover, and such points noted for later ination.

Chapter four covers Basic filing techniques. This is often too simplistic and, given that the readers are assumed not to be complete beginners, some points seem unnecessary. For example, on page 37 the reader is reminded that the command word TO requires a single key depression and not two depressions, 'T' followed by 'O'. Later on in this chapter the author makes some simple ideas on file updating appear needlessly complicated.

The author concentrates his attention on the use of the interface for RS232 links in the fifht chapter, and in particular on the connection of printers through the link, which he considers to be its most likely use.

Finally, in chapter five we are given a ready-to-use database program; 'ready-to-use' means here machine code that in ▶

the words of the author, has not been 'cleaned up'. In fact, plenty has been left for the reader to do to tune the program to his own requirements.

Unfortunately, to read the descriptions of the code, with its line number references, and the code itself requires a great deal of flipping between the pages. An alternative presentation of the code could have greatly helped readability.

The last book we're going to look at is only partially concerned with those facilities. *An Expert Guide to The Spectrum* by Mike James is aimed at the experienced user, but this time is looking at the whole range of facilities available on the Spectrum and how together they make the Spectrum such a successful microcomputer.

In fact only 50 pages are spent on the Interface 1. However, James makes up in presentation and clarity for any comparable lack of detail.

After an introductory chapter, three chapters cover both the structure of the Spectrum and the internal structure of ZX Basic. Neither is done at the detailed working level that a machine-code programmer might require, but the approach is at a sufficient level to enable a Basic programmer to use Basic more effectively.

The fifth chapter discusses streams and channels, and the general method for dealing with different I/O devices. Ian Sinclair's book tends to hide this away; Mike James seems to have struck a better balance, recognising the significance of the concepts involved.

Many users find streams and channels a little mystifying, so this book should help clarify these.

The next three chapters cover the use of the video display, the tape system, the sound generator, and the ZX printer – all quite adequate.

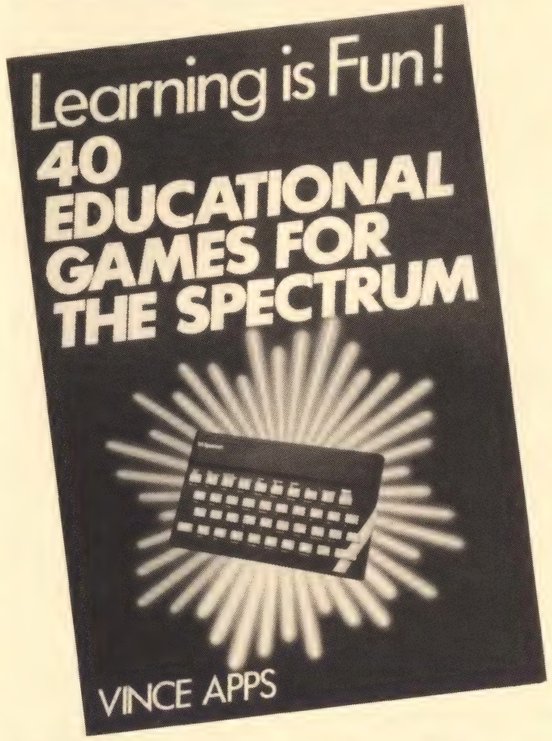
Next, there are three chapters devoted to Interface-1, the microdrive, RS232 links, and networking. The final chapter is a collection of applications, examples to illustrate the way in which the facilities discussed throughout the book may be used.

Mike James' book is the one that we found gave explainations at the most suitable level, and whose material was most accessible. In particular, the contents steer you very quickly to the right section of the book.

So which book is for whom? If you are a machine-code hacker eager for details Ian Logan's book is for you. If your particular concern is file handling then Ian Sinclair's book is useful, and is also easy to read.

But if you are looking for a good all-round approach in a very readable form, then Mike James' book is your best bet.

By Martin Field, a lecturer in Computer Science at the University of East Anglia.



***40 Educational Games for the Spectrum*, by Vince Apps.**

For better or for worse, microcomputers have now found their way into schools throughout the nation.

There is still doubt and controversy in educational circles about how best to use them in the classroom, particularly about their place in primary schools. There is still a shortage of suitably trained teachers, and the machines themselves are still in quite short supply. However, great strides are now being made in the quality and availability of educational software.

This book is aimed at the family which already owns a Spectrum and would like to use it to help increase both general knowledge and familiarity with computers. The text introducing each of the programs is addressed specifically to the younger members of the family (this sometimes produces the dubious advice that any problems should be referred to parents!).

The programs are all specific to the Spectrum, and a working knowledge of that machine is assumed throughout. The program descriptions are very brief and mostly limited to details of how to play the game. Occasional vague hints on how to alter the program are given, but the programs themselves are not connected.

One major task of what instructions *are* provided is to explain which of the many inconsistent sets of conventions for entering data is used. Some of the programs require upper case characters, and some lower case, and some don't mind.

In some you have to press ENTER to register your answer, in others you don't. Obviously it's not possible to specify universal standards, but it would have been nice to have had a bit more consistency about such matters within the book.

A wide variety of games are provided, covering many different subjects. Number skills are well represented, as are programs dealing with letters and words. History, geography and more general reasing are also included. Most of these games are quite interesting, with some use of the Spectrum's colour, graphics and sound capabilities, however, the shortness of the programs means that the overall presentation isn't as smooth as that of the commercially available ones.

We gave this book to a teacher without much previous experience of computing. After being introduced to the Spectrum, he was able to type in a number of the programs without serious error (he did have some difficulty in reading parts of the dot-matrix listings, though).

The lack of descenders on lower-case characters produced some problems, as did the precise number of spaces needed in some PRINT statements. Sadly, these failings are not unique to this book but are widespread n the industry.

Although the listings have been taken directly from the Spectrum this hasn't stopped at least one error from slipping through: line 190 in the 'Hangman' program appears to be missing. Some detective work revealed that it shoud read 190 FL = 0; the program will not function correctly otherwise.

The teacher was on the whole satisfied that many of the programs do have some educational value, and was quite impressed with the relatively small number of lines required.

On the whole a worthwhile collection.

By Ron Yorston, a research assistant in computational physics.

***Spectrum Microdrive*,** by Dr Ian Logan is published by Melbourne House priced £5.95 (106 pages).

***Make the Most of Your ZX Microdrive*,** by Ian Sinclair is published by Granada at £4.95 (99 pages).

***An Expert Guide to the Spectrum*,** by Mike James is published by Granada priced £6.95 (190 pages).

***40 Educational Games for the Spectrum*,** by Vince Apps, is published by Granada priced £5.95 (170 pages).

KEEP IN CREDIT





WHAT ARE THE PROS AND CONS OF BUYING YOUR MICRO EQUIPMENT BY CREDIT CARD?

Regular readers of will probably have noticed that one of the most popular ways of paying for both Sinclair products and the various add-ons and peripherals manufactured by the independents, is by credit card.

As such, payment by credit card has a lot of advantages, convenience being one of them — especially if you are buying by mail order or telephone sales — which is the method many advertisers suggest.

Nevertheless, we have encountered readers with queries about the merits of using 'plastic money', and so in this month's Legal File we intend to examine two of the most frequently encountered questions.

First of all, there still seems to be a lot of conern about just how expensive it really is to use a credit card. The point to be remembered here is that (with the exception of American Express and Diners Club, which charge an annual subscription to cardholders) as long as you pay your monthly statements on time and in full, so that there is never any balance outstanding, using a credit card will cost you nothing. The card companies, for example, do not charge you a percentage commission on the value of the goods you buy and, as long as there is no unpaid balance, there is nothing for you to be charged interest on.

Used in this fashion, credit cards like Access and Barclaycard are a very useful way of deferring payment for about four weeks. Where the difficulties start is when you do not pay off each monthly statement in full and start running up interest charges on the unpaid balance.

What you have to accept is that the credit card companies are all out to make a profit. The way they do this is by charging you interest, and this can vary from being reasonable to downright exhorbitant. Before running up credit card debts then, first check to see what the interest rate is going to be. If you read on your credit card statement wording to the effect that 'The current interest rate is 2 per cent per month', this does not mean that you are getting a bargain. To find out what you are really paying, multiply this figure by 12.

Using a credit card can cost you nothing at all, but if you are going to start running up debts, do watch the interest rates.

The second point of concern is as to just how could credit cards protect the position of consumers?

The point of law at issue here is that as a result of Section 75 of the Consumer Credit Act 1974, since 1977 both the seller of the goods and the supplier of the credit — in this case the credit card company, but it could just as easily be an HP company — are 'equally' liable for the goods sold.

Technically speaking, the Act refers to situations giving rise to claims of 'misrepresentation' or 'breach of contract'. In practice what this means is that if you buy a defective dongle, but the supplier you bought it from has gone out of business before you can do anything about it, all is not lost, for you can claim your money back from the credit card company.

Naturally this useful right is hedged around with limitations; for example, it only applies to credit cards — not bank cheque cards — so watch out with your Barclaycard, which can be used for both.

It also only applies to 'consumer' purchases, and not to goods which are bought for use in a business. Thus the fact the 'Spectrum' is widely termed a 'home computer' does not mean that you are covered by Section 75 if you only use it for business book-keeping purposes.

Lastly, there are financial limitations which seriously restrict the scope for claims. To be precise claims can only be made if the cash price for the goods in question is more than £100 but not in excess of £10,000. This, it should be noted, is a new monetary limit, as the lower level used to be £30. Furthermore, from the 20th May 1985, the upper limit will also be raised — to £30,000 — although we suspect this is unlikely to be of much relevance to most of our readers!

In many cases then, payment by credit card can considerably enhance your legal rights when a dispute arises — but only if certain pre-defined circumstances are also present.

Charles Christian (above) is a qualified barrister and a computer writer, who will using his knowledge of Britain's impenetrable legal system to answer your complaints and queries in a comprehensive way. If you want access to the Legal File use the question card bound in with this issue, and mark the card 'Legal File'.

GETTING ONTO THE BOARDS: STEP-BY-STEP GUIDE

Entering the world of micro communications can appear daunting. In order to make things easier for Sinclair users we have prepared a layman's guide to accessing bulletin boards. *Sinclair Answers* has its own board — CABB — but the information given here will stand you in good stead with all the systems used in the UK.

To access any bulletin board, first connect your micro to the modem via the RS232 interface (list of recommended RS232 add-ons is provided in *Table 1*). Now load our communications software (*Specterm*, Issue No. 1).

Check that the default values in the communications software are correct for the board you intend to call. Baud rates are given in our guide (see *Table 3* below) and virtually all boards are full duplex (that is, informa-

TAB.1 **Recommended RS232 interfaces for communications use:**

Supplier:	Name:	Price inc. VAT	Comments:
JWV Software, 139 Allington Drive, Strood, Kent.	Micro Mania RS232 interface	33.50	Enclosed. Needs extra resistor for Maplin modem. Comes with JWV's own programs.
Maplin Electronic Supplies PO Box 3, Rayleigh, Essex SS6 8LR. Tel: (0702) 552911.	Serial interface	£17.95	Kit form. Some skill at electronics needed. Uncased.
U-Microsystems, Winstanley Ind Est, Long Lane, Warrington WA2 8PR. Tel: (0925) 54117.	RS232 interface	£34.50	Requires motherboard (£25.30) to use it. Covers (£3.45)
Eprom Services, 3 Wedgewood Drive, Leeds LS8 1EF Tel: (0532) 667183	Dual Serial interface	£25.95	Uncased. Complicated instructions for modem connections.
Microcomputer Resources, 1 Branch Road, Park Street Village, St Albans, Herts. Tel: (0727) 72917.	Universal modem adaptor for ZX81	£34.95	Contains software on ROM.

Please note: Sinclair Interface 1 is NOT recommended.

cases Prestel software and bulletin boards' are incompatible.

ACCESSING CABB

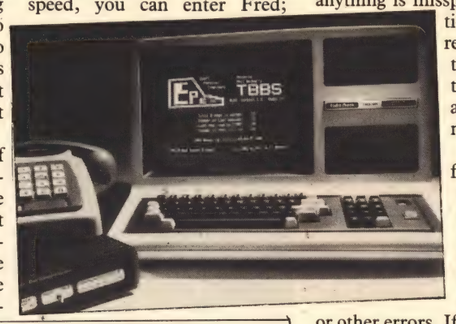
Ensure the modem has been set to the correct baud rate and mode (that is, originate) then dial (01) 631 3076. When CABB's modem answers the call, you will hear a whistling sound. It is often necessary to flick a switch on your modem to initiate communications. Users with acoustic couplers must put the mouthpiece into the correct end of the coupler.

The most common cause of problems is the micro-to-modem cable. Check with the modem supplier if you suspect that the connections are incorrect. Some modems require one of the pins on the RS232 to be 'high' before they start communicating, and this may require cross connecting two pins in order to fool the modem into working.

If all is well, the greetings text should appear on your screen.

When prompted, enter your first name and then carriage return <CR>.

Enter your last name (for speed, you can enter Fred; Bloggs; Anytown) <CR>.



After the system has checked the userlog (it takes a little while), it will ask for town/country if you are a new user.

The board will then display 'CABB welcomes FRED BLOGGS, calling from ANYTOWN. Is this correct?'

Check this very carefully. If anything is misspelt or corruption has occurred (normally in the form of little squiggles) answer N for no.

The reason for being so careful is that any personal message sent back to you will mirror the misspellings or other errors. If next time you log on with the correct data it will appear that you have no mail.

Take a note of your own details, as it is fairly common for users to log on under a nickname, Dave for example, then wonder why the system does not recognise them as David.

Once satisfied that the details are correct, enter Y for yes. The system will then ask for a screen width. Spectrums are usually 32 characters but 40 and 80 are other common settings. The user is then presented with a list of popular micros.

There are established settings for the QL <L> and Spectrum <K> but these are set up for communications software such as *Specterm* so if you have anything different hit <CR>. Then CABB will ask: ▶

TAB.2 **Recommended modems:**

Model name:	Supplier	Baud rate:	Price (inc. VAT)	BT approval
MM 102	**Answercall,** Kangley Bridge Road, London SE26 5AH. Tel: (01) 659 1133.	300	£75	Yes
Busbee	**Bee Systems,** 29-31 Back Cheapside, Bolton BL1 1LT. Tel: (0204) 395440.	1200/75	Under £100	Yes
Buzzbox	**DaCom Systems,** 26 Heathfield, Stacey Bushes, Milton Keynes MK12 6HR. Tel: (0908) 311885.	300	£86	Yes

tion flows both ways simultaneously).

The protocols needed for bulletin boards will be: 1 start bit, 8 data bits, 1 stop bit, no parity; or 1 start bit, 7 data bits, 1 stop bit, even parity. Some bulletin boards can be accessed using Prestel/Micronet software, and these are marked in our guide. However, in the majority of

following three questions:

Can your terminal print lower case?

Does your terminal need line feeds?

How many nulls do you require?

The first two questions need little explanation, but should you ask for no line feeds and find that everything gets printed on the same line it will spell trouble.

The solution is to input two 'S's and then press X followed by F. This should get you to <F>ormat from the system settings menu.

The opportunity to reconfigure your system settings will be then presented and you can ask for line feeds. Should you still be confused you'll have to call back using a slightly different name!

Alternatively, call up as LOST;PASSWORD and ask the Sysop to change your userlog entry — not forgetting to give your real name.

The question asking how many nulls are required is really for users who have unbuffered printers attached to their micros or unusually slow terminals. In most cases, zero (0) nulls are required.

If you selected <K> for the Spectrum, CABB then prints:

Upper/lower case

Line feeds needed

00 nulls required after each <CR>

Do you wish to modify this?

Unless you have unusual software, the answer is naturally N for no.

The system now asks for an eight character password. Don't forget to take a note of it immediately as you won't be allowed on to the system under that name without the correct password.

Each user has three attempts to get the password right before being thrown off.

At this point the caller should be well and truly logged on to the system.

CABB which is using popular bulletin board software called The Bread Board System (TBBS) will then give your caller number, and the number of the last message.

The next thing to appear will be a newsfile, followed by a new user guide. If possible capture these to a printer. The newsfile is updated weekly.

The new user guide can be read again if you go to <I>nfo and select option 5.

After these two files, the user is presented with the main CABB menu.

The majority of the main CABB menu is self explanatory. Should you <P>ause a file, then use a <CR> to restart it. Software for down loading is under <D>.

Callers initially have 15 minutes on the system so speed is of essence.

It is not strictly necessary to sign off the board using <G>oodbye (but we would recommend using <G>). It is feasible just to ring off as there is no connection charge (other than your 'phone bill)!

Good hacking!

By Tony Dennis, deputy-editor.

TAB.2

DSL 2123	**DaCom Systems** (as above).	300 + 1200/75	£286	Yes
Portman	**Interlekt Electronics,** Reacis House, Portman Road, Reading, Berks RG3 1LU. Tel: (0734) 589551.	300 + 1200/75	£224	Yes
MS 21/23	**Master Systems** (Data Products), 100 Park Street, Camberley, Surrey GU15 3NY. Tel: (0276) 685385	300 + 1200/75	£199	Yes
WS2000	**Miracle Technology** (UK), 1 Great Colman Street, Ipswich, Suffolk IP4 2AA. Tel: (0473) 50304.	300 + 1200/75	£149.45	Yes
VTX500	**OEL** Gillwilly Ind Est, Penrith, Cumbria CA11 9DN Tel: (0768) 66748.	1200/75	£99.95	Yes
Nightingale	**Pace** 92 New Cross Street, Bradford BD5 8BS. Tel: (0274) 729306.	30 + 1200/75	£137	Yes
Minimo	**Steebeck Systems,** 3 The Paddock, Hambridge Road, Newbury, Berks RG14 5TO. Tel: (0635) 33009.	300	£110.40	Yes

TAB.3

Board Name:	Tel. No:	System operator	Hours:	Baud rate:
(TBBS systems:)				
Blandford Board	(0258) 54494	Leo Knaggs	24hrs	300
CABB	(01) 631 3076	Tony Dennis	24hrs	300 1200/75
CNOL	(0524) 60399	Mike Buckingham	12-10pm	300
Mailbox-80 Liverpool	(051) 428 8924	Peter Tootill	24hrs	300
Mailbox-83 West Mid	(0384) 635336	Jim Roden	17.30-08.30	300
Metro	(01 341 7840	Paul Beaumont	24hrs	300+1200/75
Micro Live	(01) 579 2288	BBC tv	24hrs	300
Microweb	(061) 456 4157	Mike Bibby	24hrs	300
North Birm BBS	(0827) 288810	Paul Smith	24hrs	300
PIP Sheffield	(0742) 667983	Quentin Reidford	24hrs	300
System CBB	(01) 606 4194	Dave Coles	24 hrs	300
TBBS London	(01) 348 9400	John Nolan	24hrs	300
CBBS (R) systems:)				
CBBS (R) Chiltern	(07073) 28723	Ken Hirst	21.00-08.00	300
CBBS (R) MG-Net	(01) 399 2136	Peter Goldman	5-10pm Sun	300
CBBS (R) S West	(0392) 53116	Boyd Hitchcock	24hrs	300 1200/75
CBBS (R) Surrey	(04862) 25174	Mike Parker	24hrs	300
Computers Inc	(0207) 543555	Trevor Smith	24hrs	300
(Forum-80 systems:)				
Comaco-Net Hull	(0482) 831215	Graham Smith	9.30-17.30	300
Forum-80 Hull	(0482) 859169	Fred Brown	13.00-22.00	300
Forum-80 Wembley	(01) 902 2546	Victor Saleh	request	300
Hamnet Hull	(0482) 407150	John Lawrence	18.00-08.00	300
(BBC orientated systems:)				
Beeboard London	(01) 624 7460	Squid Gilmour	unknown	300
Bloxman	(0295) 720812	Alec Crawford	18.00-20.00	300
NBBS East	(0692) 630610	Jon Freeman	22.00-07.30	300
OBBS Manchester	(061) 427 1596	Robert O'Donnell	09.00-19.00	300
Southern BBS	(0243) 511077	Jonathan Sanders	24hrs	300
(Other systems:)				
Stoke ITeC	(01) 640 2617	Ian Hickman	24hrs	300
Mitcham	(01) 640 2617	Martin Newham	10.00-22.00	300
(Prestel compatible systems:)				
Aberdeen	(0224) 641585	Aberdeen ITeC	24hrs	1200/75
C-VIEW	(0702) 546373	Rochford D.C.	24hrs	1200/75
Communitel	(01) 968 7402	Bill Olivier	24hrs	1200/75
Estelle	(0279) 441188	STC Electronics	09.00-18.00	1200/75
Hackney	(01) 985 3322	Hackney B.C	24hrs	1200/75

BACK ISSUES

Computer Answers, the forerunner of Sinclair Answers, was published as a general magazine for two years before expanding into machine-specific titles. Many of the articles, answers and reviews were relevant to the Sinclair machines. Each issue costs £1.50 (inc. p&p) and is available from the Back Issues Dept. at our Frith Street address (see Contents page).

ISSUE 1 (Nov/Dec 1982):
If you want a copy of an article from this issue, please send 50p per article (see contents page for address) marking the envelope 'Copy service'. We will send you photo copies of the appropriate pages. Jupiter Ace, DEC Rainbow, Commodore 64 (reviews); ZX81 upgrade; 8/16 bit choice; Z80 cards; ASCII code; Program swapping; I/O concepts; Printer plug-in; Assembler course (introduction); Program generators; Basic queries; Graphics; Commmunications; Database management systems; The UCSD p-system; Multiuser systems; CP/M utilities; Bad-quality software.

ISSUE 2 (Jan/Feb 1983):
CP/M Plus (CP/M facelift); Memory (RAMs and ROMs explained); Baud explained; Configurations (WordStar on Epson); Program editors; Assembler course (part 1); List sorting program; Program concurrency; CP/M revealed; **Computer Answers File No 1:** Home Computing (domestic applications); Word-processing advice; Communications modems; Maintenance; Sales talk; Legal File (maintenance agreement small print).

ISSUE 3 (March/April 1983):
VisiOn and Lisa (reviews); Torch upgrading (the Tube); Changing print characters; Z80 workhouse; Assembler course (part 2); APL program language; CP/M utilities and corrupted disks.

Sinclair Clinic; Systems expertise; Beware of selling hype ('relational databases'); Business graphics (principals); Stargazing and biorhythmic software; Copyright clauses; Budget micros; Micro manufacturers answer back; Renting software; Legal File (piracy problems).

ISSUE 4 (May 1983):
Sage IV (review); Microfloppies; Data preservation; Apple IIe (review); Government's choice of micros; Monitors; Slide-show controlling; Digital input; Random numbers; Assembler (part 3); Professional games programmers.

Dragon and Texas Clinic; Making music on micros; Spreadsheets (Planner-Calc); Business graphics (practice); Toolkits; Ergonomics: Legal File (small claims procedure).

ISSUE 5 (June 1983):
Pinball Construction Set (review); VisiWord (review); Power (what constitutes a micro's muscles); IBM Clones; Buses; Data structures; WordStar Workshop (part 1); Number base conversion; Random numbers; Gw Basic; **BBC Clinic;** Business Operating System; Horserace Forecast Package (review); MasterCalc (review); Classroom computing; Games simulation; Software security; Setting up (selling your own software); Legal File (defaulting mail order advertisers).

ISSUE 6 (July 1983):
New Osborne Executive (review); Lotus 1-2-3 integrated software package (review); Plotters; Memory expansion; User-friendly software; 'Turtle' conversion job; Communications (file transference); **Commodore Clinic**; Lisp langauge; WordStar Workshop (part 2); CP/M supervisors; Computer aided design; Spreadsheets (MultiPlan); Micros in the music studio; Insurance; Computer holidays.

ISSUE 7 (August 1983):
System speed; Choosing a printer; Typewriter conversion; Preserving on Proms and Eproms; 'Turtle' conversion (Part 2); Assembler course (final part); Programmers Ten Commandments; WordStar Workshop (part 3); **Atari Clinic;**

Exploiting Operating Systems; Cassette-based word processing, spreadsheets, and databases (reviews); Computer Aided Learning (CAL); Pilot (CAL language); Data management; Selling your programs to companies; Legal File; the intricacies of copyright.

ISSUE 8 (Sept. 1983):
AMS 3 inch microdisks (review); **Computer Answers File No 1: Interfaces;** Making 3D images; WordStar Workshop (part 4); dBase II Workshop; Numbers; Recursion; Game of Life; Programming logic statements; Data compaction; **Apple Clinic;** Microsystem's insides; BCPL (language); Spreadsheet formulation; mircos in schools; Abstract computer Art; High street retailers; Legal file: the cost of going to court.

ISSUE 9 (Oct. 1983):
Colne's Armdroid robot (review); Advanced VisiCalc; Coping with cassettes; Tandy 100 versus Epson HX20; Translating Basic into Assembler; Data Programming; WordStar Workshop (part 5); dBase II Workshop (part 2); Bill Budge interview; True Random Number Generation;

Logo (language); **CP/M Clinic;** Probing the processor; microdesigning computer; database reviews; Spreadsheet formulation; computerised graphics on Rock albums; Disk prices; Legal File: customer/dealer disputes.

ISSUE 10 (Nov. 1983):
ACT Apricot (review); Hard disks (overview); The Sord M5/CGL M5 (review); Spectrum expansion (add-ons); Vic port project (Rs232 card); Break into Barcodes; Getting RAM; Wordstar Workshop (part 6); **Tandy, Dragon, Genie Clinic.**

Memory Mapping; Peripheral chips; MSX Compatibility; War games (reviews); An Epson in Turkey (roadtest *exotique*); Keyboard trainers; Computer training courses; Brixton ITeC (Econet); Buying second hand systems; Legal File (problems of setting up a software library).

ISSUE 11 (Dec. 1983):
New generation of cheap modems; printer buffers; Watford Electronics disk filing system; Disk benchmarking test; Mice-like inputting devices; Communications software; Using arrays; Seymour ('Logo') Papert (interview); Programmers Workshop ('Wolf Fence Algorithm' / 'Instrumentation'); Worms; **Sinclair Clinic;** Device drivers; Bulletin boards; dBase version 2.4 (d'Base III'); Spreadsheet DIF facility; Choosing a user group; Correspondence course in computing; GOSH — the Guild of Software Houses; Legal File: options on going to court.

(Also incorporating the ***Computer Answers* Upgrade Supplement** (gratis), which contains full information on the upgrading possibilities of the 13 most popular microcomputers.)

ISSUE 12 (Jan. 1984):
Elan Enterprise; Atari 600XL; Spectravideo; Cheap daisywheel printers; Best games of '83; Personal CP/M; Converting one Basic into another; **BBC/Electron Clinic** Cassette editors and assemblers; Games programming with sprite graphics; Bank Street Writer word processor; Reflexive VisiCalc; Start your own user group; Furniture to keep your micro tidy.

(Incorporating 'Program Power' booklet (gratis) containing listings for all the popular micros).

ISSUE 13
(Feb. 1984):
Inside Oric ROM, IBM PC jr; Joysticks; scope (games writer); Instructional games videos; special effects from dot-matrix printers; Interface l problems; Beyond Basic; Getting Sound Effects; Game of Go (Part 1); Game of Nim (Part 1); Programmers Workshop: speeding up;

Commodore 64/Vic 20 Clinic; Microcache package; Business databases; Everyman database package; Disk corruption; Cassette duplication; Second-hand peripherals; Setting-up a bulleting board; Legal File; seoncdhand micro sales.

ISSUE 14
(March 1984):
Memotech MTX; Dragon 64; Vic 20 add-on boards, adventure game writing packages; fancy fonts for the BBC; RS232 interface revealed; Bluff (game); Go (Part 2); BBC disk file expansion; Nim (Part 2); Fog Index (game); Wordwhizz (game); Assembler Workshop; Basic Workshop; **Spectrum / ZX81 Clinic;** Operating systems; Business: accounts packages; accessible mega-databases; weekend training course.

Introducing *Computer Answers* Bulletin Board-CABB — our very own, free electronic magazine; Legal File — what are the pros and cons of buying a micro with a credit card.

ISSUE 15
(April, 1984):
Sinclair QL; Apple Macintosh; Disk drives; programming by video; Tactical computer war games; Spectrum graphics packages; VDU conversion; Documentation; Data compaction; Atari Graphics modes; Oric synthesizer; Four-sight game; Philip '*The Hobbit*' Mitchell interview; screen display storage;

BBC/Electron Clinic; Operating systems (Part 2); Using your micro to make money; *Brainstorm* 'ideas processor'; *Starburst* and *Starindex* data management packages; Micro repair sources; Legal File; up-market micro deals.

ISSUE 16
(May, 1984):
New generation of Japanese MSX micros (Part 1); Transam Wren (review); New range of high-quality dotmatrix printers; Upgrading to disk drives; Hurg games designer; Motorola 68000 chip; Commodore interactive *Battleships;* Spectrum animation techniques; Guide to the Dragon's 6809 processor; *Crocus* — crossword solving program; BBC program security;

Commodore 64/Vic 20 Clinic; Operating systems (Part 3); Micro system cleaning products; Legal File: software houses' case.

ISSUE 17
(June, 1984):
Japanese MSX micros (Part 2); BBC add-on boards; Cheap modems; Cheap CP/M; Program testing techniques; Creating your own adventure routines; Spectrum animation techniques (Part 2); Spectrum sound effects techniques; *Towers of Hanoi* (game for the 48K Spectrum); *Reversi* (game for the Spectrum); Converting Vic programs to run on the 64; Assembler Workshop;

SuperClinic: masses of Q&As on the Spectrum, BBC, Commodore, Oric and Dragon machines, including articles on Dragon Pascal and Oric hires graphics; Backup and archiving (*Clip* package); Wiring up your own connecting leads; Operating System tables (appendix); Legal File: advantages of 'under-age' software authors.

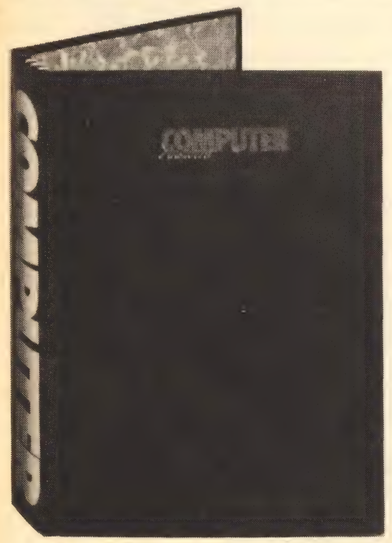
ISSUE 18
(July/Aug 1984):
Robot arms and servo-controllers; PC Junior Creview); Amstrad (review); *Homeword* word-processing package; radio software; MIDI System; Incorporating dialogue into your adventure games; C language; techniques for getting the PRINT AT function on the Vic 20 and Commodore 64; Syllogism program; Basic Workshop: programming idioms; **Sinclair Clinic**; database packages; *Everyman* revisited; Software piracy; stationery supplies; Legal File: what to look out for when signing contracts.



FLASHBACKS

The first issue of *Sinclair Answers* was published last September, and is still available from our back issues department at the VNU Frith Street address given on the contents page. Each issue costs £2.50 (including postage and packing); so here's a run-down of what you might have missed:

Century of Expansion (100 add-on possibilities for the Spectrum); Speech synthesis; speech recognition; music synthesis add-ons; Beta disk system; *Hungry Herman* (games listing); souped-up sound effects; graphics animation; QL 'turtle' graphics; Checksum utility program; QL SuperBasic; *Toolkit* and *HI-T* utility packages; Getting the most out of Microdrives; Getting intimate with your Spectrum (a basic, basic guide for new owners); Spectrum Prolog; Spectrum business packages (reviews); *Which Tax* package (review); *Sci-File* program generator (review); Legal File: copyright liabilities of games designer packages. (Free Spectrum keyboard overlay also comes with this issue.)



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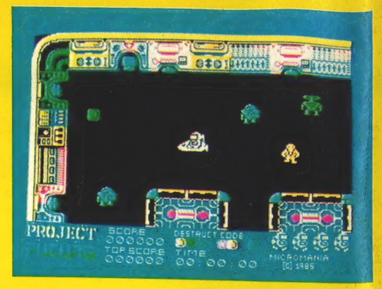
Bud Computers Ltd., **FREEPOST**, 196 Milburn Road, Ashington, Northumberland NE63 1BR
Trade and export enquiries welcome.

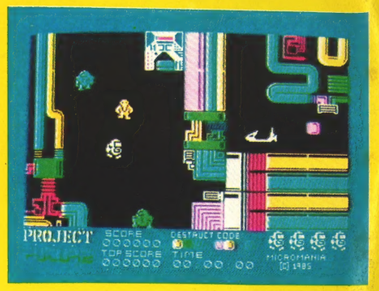
Bud Computers
AHEAD WITH IDEAS

Design: STUDIO 59

PROJECT FUTURE







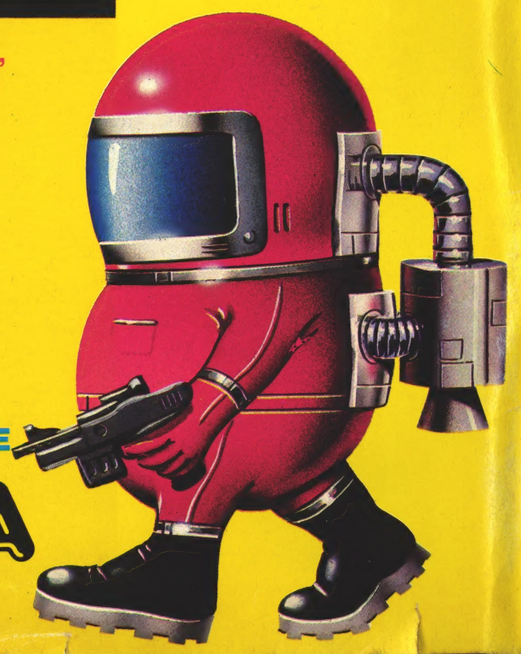
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48K SPECTRUM

PROJECT FUTURE – Your mission to teleport aboard, and activate the Self Destruct System, of the dreaded Star Ship FUTURE.

The SS FUTURE is a huge labyrinth of a Star Ship, covering 256 screens of the most amazing high resolution graphics ever seen on the Spectrum.



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THE MAGAZINE FOR ALL SPECTRUM & QL USERS

JANUARY/FEBRUARY 1985 £1·50

SINCLAIR Answers

HARDWARE TOP TEN:
WE SURVEY THE TOP-SELLING SPECTRUM PERIPHERALS.



GAMES-
Assault: a wargame listing in full bloodied colour.

REVIEWS-
Full Spectrum add-on keyboard survey.

The pluses and minuses of the Spectrum Plus.

PROJECT-
Get into a right mess with our joystick building guide.

COMPETITION - Win a Wafadrive and keyboard, ...or some QL software.

28 What influences your purchase of microcomputer magazines?

Please rate the following attributes on a scale from 0-4.
0 = Little influence and 4 = Strong influence

- ☐ Software reviews
- ☐ Industry gossip
- ☐ Hardware reviews
- ☐ Program listings
- ☐ Features on programming
- ☐ Hints and Tips on programming
- ☐ International news
- ☐ Peripherals review
- ☐ Book reviews
- ☐ Operating system features
- ☐ News
- ☐ Reputation
- ☐ Exclusive Reports
- ☐ Case studies
- ☐ Construction projects
- ☐ People/company profiles
- ☐ Language features
- ☐ Games reviews
- ☐ Games charts
- ☐ Communications features
- ☐ Graphics features
- ☐ Letters
- ☐ Queries answered
- ☐ Information from adverts
- ☐ Readability
- ☐ Contents page
- ☐ Photography
- ☐ Competitions/Special Offers
- ☐ Illustrations
- ☐ Cover design
- ☐ Price
- ☐ Availability

29 How many magazines do you purchase each month?

Please state _____

Please list other magazines you purchase, each month, in order of preference.

1 _____
2 _____
3 _____
4 _____
5 _____

30 What magazines do you subscribe to? Please list

Personal Details

Name _____

Address _____

Age ☐ Under 12 ☐ 14-19 ☐ 19-25 ☐ 26-35 ☐ 36-45 ☐ 45-65 ☐ Over 65

Sex ☐ Male ☐ Female

Occupation

What is your job title? _____

What type of business or industry is your organisation engaged in?

Other, eg Educational Establishment _____

Student _____

Income

- ☐ Up to £7,500
- ☐ £7,500-£12,000
- ☐ £12,000-£20,000
- ☐ £20,000+

Many thanks for the time you have spent completing this questionnaire. Please return it to the address below.
No postage is required.

Interco Business Consultants
Freepost
London
SW14 8BR

HELP A CHARITY THIS CHRISTMAS

STOP!
ALL MICROCOMPUTER USERS WE NEED YOUR HELP

Interco Business Consultants are conducting an independent research exercise to discover what you the computer user feels about microcomputing. Your answers will be invaluable in helping us to build up a detailed profile of the UK microcomputer market. In return for your help, we are helping the six charities listed below. For every 10 completed questionnaires returned we are donating a crisp one pound note. We are depending on your support.

★ British Heart Foundation ★ MENCAP ★ ICAA ★ Cancer Research
★ British Red Cross Society ★ Save the Children Fund

We would be grateful if you could complete the questionnaire and return FREEPOST to Interco ASAP. Merry Christmas and Happy microcomputing. Thank you for your help.
Please answer each question by ticking the appropriate box or boxes.

Microcomputer Ownership

1 Do you own a microcomputer?

- ☐ Yes
- ☐ No

If no go to question 10.

2 What make/model of microcomputer do you own?

Make _____
Model _____

3 Do you own any other microcomputers? If so, please list:

Make _____ Model _____
Make _____ Model _____

4 When did you purchase your microcomputer?

- ☐ Less than six months
- ☐ six months to a year
- ☐ More than a year ago
- ☐ More than two years ago

5 Where did you purchase your microcomputer?

- ☐ Specialist Dealer
- ☐ Retail Outlet eg WH Smith
- ☐ By Mail Order
- ☐ Second Hand Purchase
- ☐ or was it a gift?

6 What influenced your choice of microcomputer and software?

Please rate the following attributes on a scale from 0-4.
0=Little influence and 4=Strong influence.

Part 1

Hardware	Software	
☐		Appearance
☐	☐	Memory size
☐	☐	Price
☐	☐	Ease of use
☐	☐	Hardware/Software Compatibility
☐	☐	Expandability
☐	☐	Communications capability
☐	☐	Documentation
☐	☐	Packaging
☐	☐	Training
☐	☐	Hardware/Software Availability
☐	☐	Operating System(s)

Part 2

☐	☐ Magazine Articles
☐	☐ Books
☐	☐ Friends' advice
☐	☐ Consultant's advice
☐	☐ Colleagues' advice
☐	☐ Newspaper advertising
☐	☐ Magazine advertising
☐	☐ TV advertising
☐	☐ Radio advertising

7 Are you planning to upgrade your micro in the next:

- ☐ Six months
- ☐ Nine months
- ☐ 1 year
- ☐ Not at all

8 If so, what make/model of micro are you planning to purchase?

Make _____ Model _____

9 If you are going to upgrade your microcomputer at work, what make/model is involved?

Make _____
Model _____

Time Scale:

- ☐ In six months
- ☐ Nine months
- ☐ 1 year
- ☐ Not at all

Using a Micro

10 Do you use a microcomputer? If No, go to question 12

If Yes, is it at

- ☐ Home
- ☐ Work
- ☐ Both home and work
- ☐ A club
- ☐ A friend's house

11 What make(s) of micro do you use? Please List

Make _____ Model _____

Location _____

12 Are you planning to buy a micro in the next:

- ☐ Six months
- ☐ Nine months
- ☐ 1 year
- ☐ Not at all

13 What make/model of micro are you planning to purchase?

Make _____

Model _____

Peripheral Ownership

14 Do you own a printer?

If no go to question 15
If yes what make/model is it?

Make _____

Model _____

15 Are you intending to purchase a printer in the next:

- ☐ Six months
- ☐ Nine months
- ☐ 1 year
- ☐ Not at all

16 Do you own a disk based system?

Yes _____

No _____

If no go to question 18

17 How many disks do you buy a year? (please state) _____

18 Are you planning to buy a disk based system in the next

- ☐ Six months
- ☐ Nine months
- ☐ 1 year
- ☐ Not at all

19 What other peripherals do you own? What peripherals are you planning to purchase?

Own	Plan to buy	
☐	☐	Plotter
☐	☐	Monitor
☐	☐	Light Pen
☐	☐	Joystick
☐	☐	Mouse
☐	☐	Graphics tablet
☐	☐	Additional memory pack
☐	☐	Modem
☐	☐	Add-on board (please specify)
☐	☐	Other (please specify)

Micro Usage

20 What do you presently use your micro for?

At work	At home	
☐	☐	Games
☐	☐	Arcade style
☐	☐	Adventure
☐	☐	Strategy
☐	☐	Simulation
☐	☐	Education
☐	☐	Word processing
☐	☐	Database
☐	☐	Accounts
☐	☐	Stock Control
☐	☐	Spreadsheet
☐	☐	Home Communications/ Bulletin Boards
☐	☐	Business Communications
☐	☐	Mainframe communications
☐	☐	Programming
☐	☐	Scientific/Engineering
☐	☐	Applications Development: (please specify)
☐	☐	Graphics: Please state
		Business ☐
		Home ☐
		Presentation ☐

21 What software packages do you use?

Please state name of package(s) (Educational and Business Applications only)

22 Are you going to upgrade your software?

- ☐ Yes
- ☐ No

If so what kind(s) of software will you buy? Please list in order of preference

23 How much do you spend on software a month?

- ☐ Under £10
- ☐ £11-£49
- ☐ £50-£99
- ☐ £100-£199
- ☐ £200-£299
- ☐ £300+

24 On average how much time do you spend per week using your microcomputer?

Hours						
1-3	4-6	7-9	10-12	13-15	20+	Applications
☐	☐	☐	☐	☐	☐	Games
☐	☐	☐	☐	☐	☐	Arcade style
☐	☐	☐	☐	☐	☐	Adventure
☐	☐	☐	☐	☐	☐	Strategy
☐	☐	☐	☐	☐	☐	Simulation
☐	☐	☐	☐	☐	☐	Education
☐	☐	☐	☐	☐	☐	Word processing
☐	☐	☐	☐	☐	☐	Database
☐	☐	☐	☐	☐	☐	Spreadsheet
☐	☐	☐	☐	☐	☐	Accounts
☐	☐	☐	☐	☐	☐	Home Communications/ Bulletin Boards
☐	☐	☐	☐	☐	☐	Business Communications
☐	☐	☐	☐	☐	☐	Mainframe communications
☐	☐	☐	☐	☐	☐	Programming
☐	☐	☐	☐	☐	☐	Scientific/Engineering
☐	☐	☐	☐	☐	☐	Applications Development:
						Graphics:
☐	☐	☐	☐	☐	☐	Business
☐	☐	☐	☐	☐	☐	Home
☐	☐	☐	☐	☐	☐	Presentation

Reading Matter

25 Which of these do you read regularly?

- ☐ Times
- ☐ Guardian
- ☐ Daily Telegraph
- ☐ Daily Mail
- ☐ Daily Express
- ☐ Daily Mirror
- ☐ Daily Star
- ☐ Sun
- ☐ Financial Times
- ☐ Sunday paper (state which one) _____
- ☐ Management publications (please state) _____
- ☐ Other regular journal (please state) _____

26 Which of the following magazines do you read?

* Regularly = One every two months/weeks
* Sometimes = One every three months/weeks.
* Please place a number in the appropriate box(es) on the Number of other readers.

Regularly*	Sometimes*	Never	Number of other readers*	
☐	☐	☐	☐	Acorn User
☐	☐	☐	☐	Big K
☐	☐	☐	☐	Byte
☐	☐	☐	☐	Commodore Answers
☐	☐	☐	☐	Commodore Horizons
☐	☐	☐	☐	Commodore User
☐	☐	☐	☐	Computer & Video Games
☐	☐	☐	☐	Computing Today
☐	☐	☐	☐	Crash
☐	☐	☐	☐	Creative Computing
☐	☐	☐	☐	Electron User
☐	☐	☐	☐	Home Computing Weekly
☐	☐	☐	☐	Micro Decision
☐	☐	☐	☐	Micro User
☐	☐	☐	☐	Orchard
☐	☐	☐	☐	PC Business World
☐	☐	☐	☐	PC Magazine
☐	☐	☐	☐	PC User
☐	☐	☐	☐	Personal Computer Games
☐	☐	☐	☐	Personal Computer News
☐	☐	☐	☐	Personal Computer World
☐	☐	☐	☐	Personal Computing Today
☐	☐	☐	☐	Popular Computing Weekly
☐	☐	☐	☐	Practical Computing
☐	☐	☐	☐	QL User
☐	☐	☐	☐	Sinclair Answers
☐	☐	☐	☐	Sinclair User
☐	☐	☐	☐	What Micro?
☐	☐	☐	☐	Which Computer
☐	☐	☐	☐	Which Micro and Software Review
☐	☐	☐	☐	Your 64
☐	☐	☐	☐	Your Computer
☐	☐	☐	☐	Your Spectrum

27 Please list your top five computer magazines in order of preference

1 _____

2 _____

3 _____

4 _____

5 _____